Designation: D 3285 – 93 (Reapproved 2005)

An Amrican National Standard

Standard Test Method for Water Absorptiveness of Nonbibulous Paper and Paperboard (Cobb Test)[1]

This standard is issued under the fixed designation D 3285; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the quantity of water absorbed in a specified time by nonbibulous paper and paperboard with a minimum thickness of 0.1 mm. This test method is generally applicable to sized paper and paperboard, but is not recommended as a sizing test for writing papers. The test method is based upon studies by Cobb and Loew, Cobb, and other investigators (**1**, **2**, **3**, **4**).[2]

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [3]

D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, and Related Product

D 685 Practice for Conditioning Paper and Paper Products for Testing

D 824 Test Method for Rate of Absorption of Water by Bibulous Papers

3. Significance and Use

3.1 Water absorptiveness is a function of various characteristics of paper or board, including sizing, porosity, and fiber composition.

3.2 This test method is useful in comparing various sheets or nonbibulous (not highly absorbent) paper or paperboard as to the relative rate of penetration of aqueous solutions, such as adhesives or coatings. It will indicate to some degree the surface and internal sizing. This test method is not intended as a water-resistance test, nor to measure the resistance to minute quantities of a liquid, such as from a writing pen.

4. Apparatus

4.1 *Water Absorption Apparatus*, to permit one side of the specimen to be wetted uniformly at the moment the soaking period begins, and to allow controlled rapid removal of the water from the specimen at the end of the test period. The specimen holder as shown in Fig. 1 comprises a metal ring with a machined lower face, 11.28 ± 0.02-cm inside diameter (corresponding to a cross-sectional area of 100 cm^2), 2.5 cm high and about 0.6 cm thick, clamped to a flat base plate about 15 by 15 cm with a metal cross bar 17 by 2.5 by 0.6 cm and two wing nuts on a pair of studs. The cross bar has a hole at one end and a slot at the other to facilitate assembly and use. On the base plate is a rubber mat, larger than the outside dimensions of the ring, on which the specimen is clamped.

NOTE 1—The metal parts should preferably be of brass or other corrosion-resistant material.

NOTE 2—Several versions of the water absorption apparatus are now available. Although the basic procedure for performing the test is not changed, the clamping mechanism is. This may affect the time required to remove the specimen from the apparatus.

4.2 *Metal Roller*, solid brass having a smooth face 20 cm wide and weighing 10.0 ± 0.5 kg.

4.3 *Timer*, stopwatch or electric timer reading in seconds.

4.4 *Graduated Cylinder*, 100 mL.

4.5 *Balance*, with an accuracy of 0.01 g, or better.

5. Reagents and Materials

5.1 *Water*, distilled or deionized.

5.2 *Blotting Paper*, a quantity of sheets of standard blotting paper, 200 mm^2(8 $in.^2$), weighing 250 ± 10 g/m^2 oven-dry, 0.495 to 0.521 mm (0.0195 to 0.0205 in.) thick, and having a rate of absorbency of 25 s or less when tested with 1.0 mL of water in accordance with Test Method D 824. The blotter must have a capillary rise of 50 to 100 mm of water (mean of MD and CM) when measured by the Klemm Test (see annex).

[1] This test method is under the jurisdiction of ASTM Committee D06 on Paper and Paper Products and is the direct responsibility of Subcommittee D06.92 on Test Methods.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this test method.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

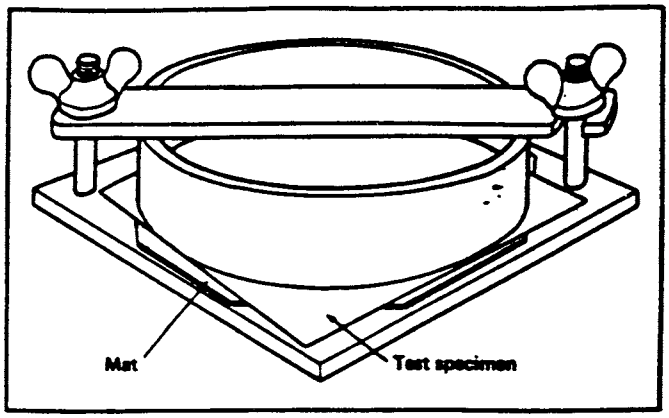

FIG. 1 Water Absorption Apparatus

6. Test Specimens

6.1 Obtain a sample of the paper in accordance with Practice D 585. From each test unit, cut specimens to a size slightly greater than the outside dimensions of the ring of the apparatus (that is, squares 125 by 125 mm). The test pieces should be free of folds, wrinkles, or other blemishes not commonly inherent in the paper. For hard-sized papers (absorbing less than 100 g of water/m^2) use 10 specimens per test unit. For soft-sized papers (absorbing more than 100 g/m^2) use 20 specimens.

7. Conditioning

7.1 Condition the specimens in accordance with Practice D 685. Test under the standard conditions specified therein.

8. Procedure

8.1 Weigh each specimen to the nearest 0.01 g.

8.2 Test half the specimens with the wire side up, the other half with the felt side up.

8.3 Place a dry rubber mat on the metal plate and lay a weighed specimen on it. After wiping the metal ring perfectly dry, place it upon the specimen, and fasten it firmly enough in place with the crossbar to prevent any leakage between the ring and the specimen. For reporting, the test side is the one that is in contact with the water during the test.

NOTE 3—For materials where leakage between the ring and the upper surface of the test specimen may occur during the test, a soft elastic nonabsorbent gasket may be used. The gasket should have the same internal dimensions as the ring.

8.4 Unless otherwise specified, use a test period of 120 ± 5 s for performing this test method. See Appendix X1 for a discussion of paper properties which may necessitate the use of other test periods.

8.5 Pour 100 mL of water into the ring as rapidly as possible, thus giving a head of 1 ± 0.1 cm. Start the stopwatch immediately. At 15 ± 5 s before the expiration of the test period, pour the water quickly from the ring, taking great care not to drop any of the water upon the outside portion of the specimen. Promptly loosen the wing nuts, swing the crossbar out of the way while holding the ring in position by pressing it down with one hand. Carefully, but quickly, remove the ring and place the specimen with its wetted side up on a sheet of blotting paper resting on a flat rigid surface.

8.6 Exactly at the end of the test period, place a second sheet of blotting paper on top of the specimen and remove the surplus water by moving the hand roller once back and once forward over the pad without exerting any additional pressure on the roller. Specimens which contain an excess of surplus water after blotting, as shown by glossy areas on the surface, should be rejected and the test repeated, decanting the water from the ring sooner. Fold the specimen with the wetted area inside. Immediately reweigh it to the nearest 0.01 g.

8.7 Subtract the conditioned weight of the specimen from its final weight, and multiply by 100 the gain in weight in grams to obtain the weight of water absorbed in grams per square metre.

8.8 If any liquid has passed through the sheet to the rubber mat, the test is not acceptable. When this occurs, either shorten the time to 60 s, or staple two or more specimen sheets together outside the test area. In such a case, the calculated test area remains that of the inside ring. For hard-sized papers, a longer period (for example, 300 s) may be found advisable.

9. Report

9.1 Report the following information:

9.1.1 Water absorbed by each side of the paper, separately, calculated as the average grams of water absorbed per square metre of sample.

9.1.2 Maximum and minimum value for each side.

9.1.3 Any deviations from this procedure, particularly the test period (usually 120 s) or the number of plies tested at one time.

10. Precision and Bias

10.1 *Precision*—Based on limited data for hard-sized papers and the means of five specimens tested per side (ten specimens per test unit):

10.1.1 *Repeatability (Within Laboratory)*—8 %.

10.1.2 *Reproducibility (Between Laboratory)*—10 %.

10.2 *Bias*—The procedure in this test method has no bias because the value for Cobb test is defined only in terms of this test method.

11. Keywords

11.1 Cobb test; Klemm test; nonbibulous paper; nonbibulous paperboard; paper; paperboard; water absorptiveness

ANNEX

(Mandatory Information)

A1. MEASUREMENT OF BLOTTER ABSORPTIVENESS (KLEMM METHOD)

A1.1 Make the test on samples conditioned in accordance with Practice D 685. Cut parallel specimen strips about 15 mm wide and at least 200 mm long in both machine and cross directions. Immerse the specimen strips suspended vertically to a depth of 10 mm in distilled or deionized water maintained at a temperature of 23 ± 1°C. After an immersion time of 10 min, read the height in millimetres to which the water rises above the water level in the container.

APPENDIX

(Nonmandatory Information)

X1. MODIFICATION OF THE STANDARD PROCEDURE

X1.1 The standard test area is 100 cm^2. If the available specimens are too small, a proportionately smaller test area may be used providing that the volume of water is reduced to provide a pressure head of 1 ± 0.1 cm. The change in area should be noted in the report.

X1.2 This test is designed for nonbibulous papers and paperboards, but satisfactory results have been obtained with up to about 20 sheets of highly absorbent paper stapled together and tested for 60 instead of 120 s.

X1.3 For very hard-sized or specially treated papers, the test may be extended to periods up to 18 h, to increase the sensitivity.

X1.4 For layers of absorbent papers, the quantity of water absorbed is almost proportional to the time of exposure. For well-sized papers, the quantity is approximately proportional to the square root of this time.

X1.5 An effect of natural aging has been noticed in many papers. For example, results on cupstock papers, aged a few weeks, are usually about 2 g/m^2 less than on papers tested immediately after being made.

X1.6 The Cobb test may also be suitable with other (water base) solutions, such as dilute lactic acid and hot coffee for food board and cup stock and possibly ink for writing and printing papers.

X1.7 Weighing the wetted specimens can be facilitated by using tared water-vapor-proof containers which will eliminate evaporation losses. Metal cans or polyethylene bags about 11 by 23 by 0.0076 cm with wire closure have been reported to be satisfactory for this purpose.

X1.8 For specimens that have long penetration times or have surfaces that are difficult to wet, substitute the distilled or deionized water with water having a known concentration of wetting agent. With the results, also indicate the exposure time, total head, wetting agent, and concentration.

REFERENCES

(1) Cobb, R. M., and Lowe, D. V., "A Sizing Test and Sizing Theory," *Technical Association Papers* 17:213 (1934); *Paper Trade Journal* 98(12):43 (1934).

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(3) Egy, W. L., "The Cobb Sizing Test," *Pulp Paper Magazine,* Canada 38(7):499 (1937).

(4) Codwise, P. W., "Water Resistance of Paper," *Technical Association Papers* 19:231 (1936); *Paper Trade Journal* 102(3):39 (1936).