Designation: D 2177 – 99 (Reapproved 2003)

An American National Standard

Standard Test Method for Ink Absorption of Blotting Paper[1]

This standard is issued under the fixed designation D 2177; 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[2] covers the determination of the rate at which blotting papers absorb writing ink. Its applicability to other papers and liquids has not been determined.

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 Products

D 685 Practice for Conditioning Paper and Paper Products for Testing

2.2 *Federal Standards:*

TT-I-55563b[4]

3. Summary of Test Method

3.1 This test method is based on the determination of the length of time required to absorb completely 1 mL of a standard writing ink at 23°C (73.4°F).

4. Significance and Use

4.1 The results from this test method have been found useful in predicting and specifying the absortive qualities of blotting papers.

5. Apparatus

5.1 *Pipet*—A 1-mL measuring pipet graduated in divisions of 0.01 mL.

5.2 *Support*—A 75-mm (3-in.) inside diameter metal ring, 400-mL glass beaker, or other suitable support.

5.3 *Stop Watch*.

6. Test Liquid

6.1 *Formula*—The standard ink used for this test is in accordance with the following formula:

Gallic acid, National Formulary, VII Edition, g	5.0
Ferrous sulfate, $FeSO_4 \cdot 7H_2O$, USP, g	7.5
Tartaric acid, USP, g	1.0
Sodium benzoate, USP, g	1.0
Soluble blue dye, Color Index 42755, acid blue 22,[A] g	3.5
Distilled water to make a volume of 1000 mL at 20°C (68°F)	

[A] Available from Pylam Products Company, Inc., 1001 Stewart Ave., Garden City, NY 11530.

6.2 In a 1-L volumetric flask put 5 g of gallic acid, 1 g of tartaric acid, and 1 g of sodium benzoate, and add 750 mL of distilled water. Set the flask in a vessel of water, but resting on a piece of wire netting or other support so that the bottom of the flask is not in direct contact with the outer vessel. Gradually heat the water in the outer vessel to about 60°C (140°F) and swirl the flask frequently until the gallic acid and tartaric acid are all dissolved. Add 7.5 g of ferrous sulfate and again swirl the flask to dissolve the iron salt. Then filter into the flask a solution of 3.5 g of soluble blue dye in 175 mL of distilled water. Wash the beaker in which the dye was dissolved with two or three 10-mL portions of distilled water which are to be poured into the funnel to rinse the filter paper. Finally, let the flask and contents cool to 20°C (68°F), fill to the mark with distilled water, and mix thoroughly.

NOTE 1—It is important that the iron content of the ferrous sulfate be known. When exposed to the air, ferrous sulfate crystals lose part of their water of crystallization and are no longer correctly represented by the formula $FeSO_4 \cdot 7H_2O$. The loss in weight may be as much as 20 % of the weight of crystals that have the correct formula. In 7.5 g of unweathered crystals there are 1.5068 g of iron. If the salt has lost 20 % in weight, 6 g of it will contain 1.5068 g of iron, and the 7.5 g called for by the formula will contain 1.8835 g of iron, or 25% more than it should. One litre of ink made with 7.5 g of this weathered salt may be expected to deposit sediment in a short time. How much water of crystallization is lost depends upon the conditions under which the ferrous sulfate is kept and, before weighing out the required quantity needed to make 1 L of ink it should be analyzed and the required weight of the salt calculated.

[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] This test method is related to the TAPPI Method T 431cm – 88.

[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.

[4] Available from Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Ave., Philadelphia, PA 19111–5094.

7. Sampling

7.1 The paper shall be sampled in accordance with Practice D 585.

8. Test Specimen

8.1 From each test unit of the sample, obtain 10 representative test specimens, each 100 by 100 mm (4 by 4 in.). The test specimens shall be cut from a test unit in such a way as to be thoroughly representative of it.

9. Conditioning

9.1 Specimens shall be conditioned and tested in the atmospheric conditions in accordance with Practice D 685.

10. Procedure

10.1 Place the test specimen on a 75-mm (3-in.) inside diameter metal ring or on a 400-mL glass beaker. The test specimen should lie flat or curve downward slightly, so that the ink remains in a pool in the center. Fill the 1-mL measuring pipet with the test ink at a temperature of 23 ± 2°C (73.4 ± 3.6°F) and flow it on the specimen near its center from the pipet holding the tip 13 mm (½ in.) from the specimen. The time of delivery of the ink must not be less than 4 nor more than 6 s.

10.2 Measure with a stop watch the time of absorption in seconds, from the start of flow of the ink until it is completely absorbed, as indicated by no further reflection of light from it when viewed at an angle. Make an equal number of tests on each side of the paper and test not less than ten specimens.

11. Report

11.1 For each test unit, the report shall give minimum, maximum, and average time of ink absorption in seconds.

12. Precision and Bias

12.1 *Repeatability of Average* is 18 s.

12.2 *Reproducibility of Average* is 25 s.

12.3 The data were obtained in an unpublished study among seven laboratories on four different papers. The stated repeatability and reproducibility were obtained when ten specimens, five wire side and five felt side, were measured. The values given did not vary significantly for absorption times less than 100 s.

APPENDIX

(Nonmandatory Information)

X1. NOTES ON SIGNIFICANCE AND INTERPRETATION

X1.1 The degree of precision obtained with this method would probably be improved only by 1 or 2 s if two sets of ten specimens each instead of one were used, because most of the variability appears to be in the material, rather than in the technique.

X1.2 The Federal Specification for blotting paper (TT-I-563b) requires a minimum absorption time of 25 s. Blotters having absorption times as high as 35 s are usually satisfactory.