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WI _____ 190808.07 _____

T _____ 432 _____

DRAFT NO. _____ 03-SARG _____

DATE _____ May 18, 2021 _____

WORKING GROUP
CHAIRMAN _____ Jeff Lundeen _____

SUBJECT
CATEGORY _____ Physical Properties _____

RELATED
METHODS _____ See "Additional Information" _____

Water absorbency of bibulous papers (Reconfirmation of T 432 cm-09 as a Classical Method) (The ballot 2 reconfirmed this Standard as a Classical Method)

1. Scope and significance

1.1 This procedure determines the time required for an unsized and absorbent paper, such as a blotter, tissue, or towel, to completely absorb a specified quantity of water, suited to the kind of paper to be tested (*I-4*).

1.2 It is not intended for sized papers nor those having an absorption time of over 120 s. Such papers should be tested in accordance with TAPPI T 441 "Water Absorptiveness of Sized (Non-Bibulous) Paper and Paperboard (Cobb Test). For corrugating medium use TAPPI T 819 "Water Absorbency of Corrugating Medium."

1.3 The water absorption results of this method can be used to judge the acceptability of tissue, toweling and blotter papers in sorptive tasks. For accurate comparisons of comparable materials this method has been superseded by more modern methods.

2. Apparatus and materials

2.1 *Volume measuring device*¹, measuring pipet (5), buret, hypodermic syringe, microburet (6), or syringe-style pipet graduated in divisions of one-tenth or less of the volume required for the test.

¹Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list, available as part of the CD or printed set of Standards, or on the TAPPI website general Standards page.

2.2 *Specimen support*, a piece of metal or other nonabsorbent material about 100 × 100 mm, with a central hole of approximately 40 mm diameter. The support is held horizontally and normally is flat, although some multi-ply specimens, which bulge upward when wetted, may require that the support with its hole be bent downwards from two opposite sides to form a trough. The curvature of the trough should be such that when the water is applied to the upper ply of the multi-ply specimen, the upper ply expands and pushes down against the underlying plies, wetting them as in normal use of the material.

2.3 *Light source*, to reflect light from the surface of unabsorbed water on the specimen, situated far enough away so that its heat will not influence the absorption time.

NOTE 1: A 1.5-V flashlight bulb, shaded from the eyes, placed about 200 mm above and to the rear of the support and operated by a “D” cell battery or a bell transformer, makes a very good light source for this purpose.

2.4 *Timer*, stopwatch or electric timer readable to 0.2 s or better.

2.5 *Water*, distilled or deionized.

3. Sampling and test specimens

Obtain a sample of the paper in accordance with TAPPI T 400 “Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product.” From each sample cut 10 specimens, each approximately 100 × 100 mm. When the material is to be used as a multi-ply unit (as, for example, a triple-ply embossed napkin), cut and test multi-ply specimens accordingly; otherwise, cut single-ply specimens.

4. Procedure

4.1 Condition and test the specimens in the conditioning and testing atmosphere specified in TAPPI T 402 “Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets and Related Products.”

4.2 In the following procedure, for papers classed as “blotting,” use 1.0 mL of water; for papers classed as “toweling” use 0.1 mL of water; and for papers classed as “tissue” use 0.01 mL of water.

4.3 Place a test specimen on the horizontal support (modified as in 2.2 when necessary) which has a clear space of at least 10 mm beneath it. Do not stretch or in any way distort the test specimen, as this may change the results from the test. Fill the appropriate measuring device with distilled or deionized water at $23 \pm 2^\circ\text{C}$.

4.3.1 If a pipet or syringe is used for the 1.0-mL volume, hold the measuring device at an angle of 30-45° to the horizontal with its tip nearly in contact with the central portion of the paper. Allow the specified amount of water to flow onto the specimen in 6 s or less, keeping the tip of the apparatus in the drop until delivery is completed.

NOTE 2: As long as the total delivery time of the water is within 5 to 6 s, the rate of application will not appreciably affect the result.

4.3.2 For the 0.1- or 0.01-mL volume, wipe the tip of the applicator with a trace of water-repellent grease. Hold the tip vertical, express a volume of 0.1 or 0.01 mL, and apply the volume directly to the specimen.

4.4 Start the timer as soon as the water contacts the specimen and measure the time for the water to be completely absorbed to the nearest 0.2 s or better, as indicated visually by the disappearance of specular reflection of light (or the moment of disappearance of the glossy or shiny area from the wet spot).

4.5 Conduct the test where neither heat from the light nor a strong current of air might influence the result.

4.6 Repeat the procedure on the other nine specimens.

5. Report

5.1 Report the type of paper tested, the volume used, and the average absorption time in seconds, to the nearest second if over 10 s, or to the nearest 0.2 s if less than 10 s.

5.2 For a complete report, give also the maximum and minimum absorption time and the number of specimens tested. If multi-ply specimens were tested, indicate the number of plies.

5.3 When the support was modified as described in 2.2, indicate this in the report.

6. Precision

6.1 Repeatability (within one laboratory) = 11-21% for toweling with absorption time in the range of 40-88 s; 15-32% for toweling in the range of 15-35 s; 19-25% for tissue in the range of 5-25 s.

6.2 Reproducibility (between laboratories), not known.

6.3 Repeatability is stated in accordance with the definition of this term in TAPPI T 1206, "Precision Statement for Test Methods." The data for toweling are based on 5 results in each range using a volume of 0.1 mL H₂O. The data for tissue are based on two results using 0.01 mL H₂O. The data for tissue are based on two results using 0.01 mL H₂O. Each result is an average of ten determinations. For best reproducibility, agreement between laboratories, it has been suggested that the water used in testing be deionized, not distilled.

7. Keywords

Absorptivity, Paper, Absorbent papers, Blotting papers, Tissue papers, Toweling papers

8. Additional information

8.1 Effective date of issue: To be assigned.

8.2 In 1999, this method was reclassified as a Classical Method, because the technology of the method has been superseded. However, the method was not withdrawn because it is referenced by another method (TAPPI T 205 "Forming Handsheets for Physical Tests of Pulp." In the om-94 revision, the precision statement was rewritten, but was based on the data used in the previous edition, In 1982, instructions to stretch the sample prior to testing were deleted.

8.3 Related methods: ASTM D 824; Canadian, PAPTAC F4; British, P & BMA PT16 (withdrawn).

Literature cited

1. Reed, E. O., "Determining the Absorbency of Paper," *Paper* **21** (19): 14 (1918).
2. Carson, F. T., and Worthington, F. V., "New Types of Equipment for Testing Paper," *Paper Trade J.* **95** (16): 59 (1932).
3. Carson, F. T., "Testing Paper for Permeability of Liquids," *Paper Trade J.* **80** (10): 59 (1925).
4. Scribner, B. W., "Standards for Paper Towels," Circular No. 407, National Bureau of Standards (1945).
5. Reese, S. W., and Youtz, M. A., "A Water Absorbency Tester Using 0.1 cc of Water," *Paper Trade J.* **100** (7): 33 (1935).
6. Carson, F. T., R. P. 959-J. Research of National Bureau of Standards 18 (Jan. 1937).

Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Standards Department. ■