



Standard Test Methods for Wet Tensile Breaking Strength of Paper and Paper Products¹

This standard is issued under the fixed designation D 829; 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 These test methods measure the (wet) tensile breaking strength of paper, paper products, and paperboard (excluding corrugated board) when saturated with water.

1.2 These test methods are intended for use with papers and paper products that will be subjected to stress while wet during processing or use, including but not limited to tissue products, papers used in map-making, photography and blue prints, bags, and food wraps.

1.3 Two test methods are described; one for samples that are able to be handled while wet without damage, and one for samples, such as tissue, that are easily damaged or impossible to handle while wet.

1.4 *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:

- D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, and Related Product²
- D 685 Practice for Conditioning Paper and Paper Products for Testing²
- D 824 Test Method for Rate of Absorption of Water by Bibulous Papers²
- D 828 Test Method for Tensile Properties of Paper and Paperboard Using Constant Rate of Elongation Apparatus²
- D 1193 Specification for Reagent Water³
- D 1968 Terminology Relating to Paper and Paper Products²
- D 3285 Test Method for Water Absorptiveness of Nonbibulous Paper and Paperboard (Cobb Test)²
- E 122 Practice for Calculating Sample Size to Estimate,

With a Specified Tolerable Error, The Average for a Characteristic of a Lot or Process⁴

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology D 1968 or the *Dictionary of Paper*.⁵

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *finch wet strength, n*—tensile strength of a sample tested using Test Method B of these test methods.

4. Summary of Test Methods

4.1 These test methods consist of two test methods as follows:

4.1.1 *Test Method A*—Immersion Wetting Procedure, see 11.1.

4.1.2 *Test Method B*—Finch Procedure, see 11.2.

4.2 In Test Method A, a test specimen is immersed in distilled water at 23°C for the time period required to reach saturation as defined in these test methods that may be as long as 24 h. After saturation, the specimen is tested as described in Test Method D 828. Test Method A is suited for papers that can be handled wet without damage, including papers that retain a high percentage of their original (dry) strength when wet such as photographic, map, and blueprint papers, food wraps, and some bags.

4.3 In Test Method B, a test specimen is saturated with water in a Finch wet strength device and then tested as described in Test Method D 828. Test Method B is suited for papers that are highly absorbent, easily damaged when wet, or both, such as tissue paper, particularly absorbent towels. Saturation generally occurs in 5 to 40 s.

5. Significance and Use

5.1 Wet tensile strength is an important performance characteristic of papers or paper products that will be processed wet or that may be subjected to wetting, whether accidental or intentional, during use.

¹ These test methods are under the jurisdiction of ASTM Committee D06 on Paper and Paper Products and are the direct responsibility of Subcommittee D06.92 on Test Methods.

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² *Annual Book of ASTM Standards*, Vol 15.09.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ Available from the Technical Association of the Pulp and Paper Industry, P.O. Box 105113, Atlanta, GA 30348.

6. Apparatus

6.1 *Tensile Tester*—A tensile tester meeting the specifications found in Test Method D 828 is suitable for these test methods.

6.2 *Specimen Cutter*—A double blade strip cutter of the JDC-type, or similar cutting die complying with the requirements for a specimen cutter in Test Method D 828 is suitable for these test methods.

6.3 *Blotting Paper*—A quantity of sheets of blotting paper 200 mm² (8 in.²) weighing 250 ± 10 g/m² oven dry, 0.495 to 0.521 mm (0.0195 to 0.0205 in.) thick and having a rate of absorption of 25 s or less when tested with 1.0 mL of water in accordance with Test Method D 824, and a capillary rise of 50 to 100 mm of water (mean of MD and CD) when measured in accordance with the Klemm Test in Annex A1 of Test Method D 3285. Required for Test Method A only.

6.4 *Dish*—A glass dish having a dimension of at least 300 mm (12 in.) in its shortest dimension, 50 mm (2 in.) deep is suitable. Required for Test Method A only.

6.5 *Finch Wet Strength Device*—A device allowing a specimen to be saturated with water and then tested without further handling. Required for Test Method B only. Two styles are available. Either one complies with these test methods.

6.5.1 *Finch Wet Strength Device (Older Style)*—A wet strength device (see Fig. 1) consisting of an inverted stirrup about 38 mm (1.5 in.) in width and about 76 mm (3 in.) in length, made of metal strap by which a horizontal rod about 28 mm (1.1 in.) in length and 5 ± 0.05 mm (0.188 ± 0.002 in.) in diameter is supported. Between the straps and under the horizontal rod is a small, vertically movable container for

holding water or other liquid. The liquid container locks in its uppermost position, so that the horizontal rod is then immersed in the liquid to a depth of at least 19 mm (0.75 in.). A thin metal tang forming the lower part of the inverted stirrup permits it to be fastened in the lower clamp of a tension testing machine.

6.5.2 *Finch Wet Strength Device (Newer Style)*—A wet strength device (see Fig. 2) consisting of a stainless steel casting of approximately 110 mm (4.375 in.) total length. A thin bottom tang about 25 mm (1 in.) in width and 19 mm (0.75 in.) in length comprises the bottom portion of the casting. The upper portion of the casting consists of a rod of about 5 ± 0.05 mm (0.188 ± 0.002 in.) in diameter about 26 mm (1.03 in.) in length affixed and supported as part of the casting such that it extends freely in a direction perpendicular to the long direction of the casting approximately 44 mm (1.75 in.) below the top of the casting. A vertically moving liquid container is fastened to the body of the casting and is free to move such that when the liquid container is filled with fluid, it may be moved to a position such that the horizontal rod is immersed to a depth of at least 19 mm (0.75 in.).

6.5.3 The main difference between the old and new style Finch wet strength devices is that the new style provides easier, direct access to the rod under which the specimen must be inserted, thus specimen loading is simpler, easier, and more rapid.

6.5.4 Finch wet strength devices similar in design to that described in 6.5.1 or 6.5.2 are available with longer rods and larger fluid containers for use with specimens wider than 1 in. (25.4 mm). The rod of the Finch wet strength device must always be at least as long as the width of the test specimen.

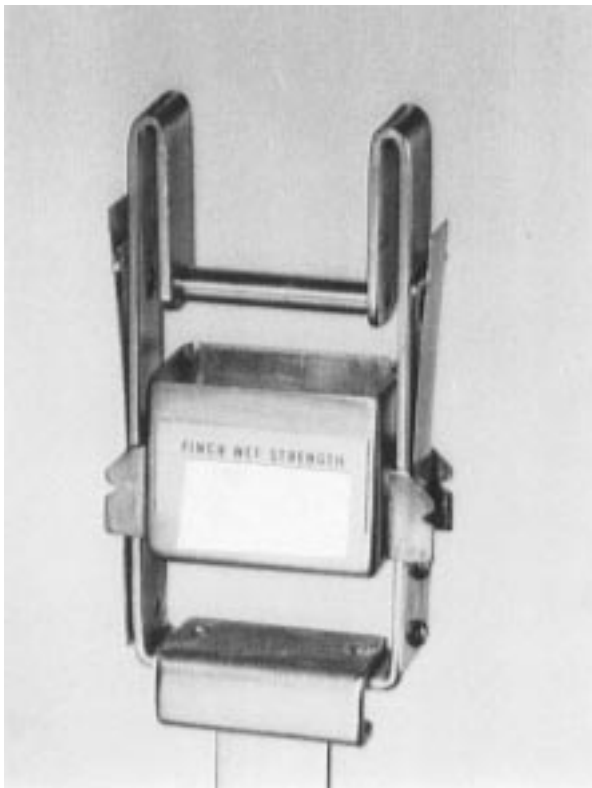


FIG. 1 Finch Wet Strength Device (Older Style)

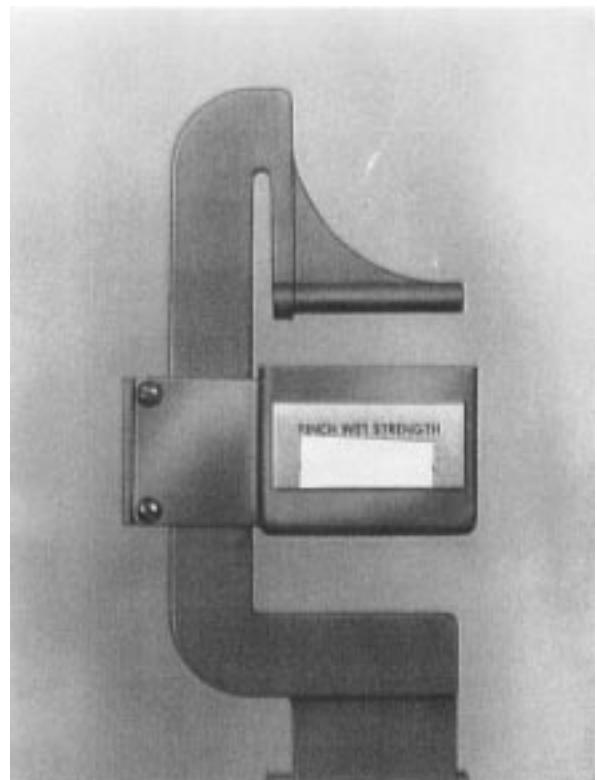


FIG. 2 Finch Wet Strength Device (Newer Style)