



Standard Test Methods for Zero-Span Tensile Strength (“Dry Zero-Span Tensile”)¹

This standard is issued under the fixed designation D 5804; 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 provides a quick reliable means to measure the zero-span tensile strength of a randomly oriented specimen of fibers when dry.

1.1.1 Similar procedures for determining the zero-span tensile strength of a randomly oriented specimen of fibers when wet are found in Test Method D 5803.

1.2 In this test method, the fibers are tested as a handsheet produced using a standardized procedure such as TAPPI T 205.

1.3 While testing is possible on finished paper materials, information on fiber quality from intermediate steps in the pulping or paper making process, or both, is frequently more useful for improving finished paper quality or improving fiber utilization of, for example, recycled fibers, or fibers subjected to new pulping, bleaching, or finishing processes.

1.4 The modifications of the procedure described in this test method required for testing finished paper is straightforward; however, testing must be done in the two principle directions of the sheet, as required in Test Method D 828, since the finished paper or paperboard will generally have non-random fiber orientation, resulting in different strength properties in the two principle directions of the finished sheet. Testing of sheets having a grammage greater than 100 g/m², which includes some paper materials described as paper and many paperboards, is difficult because of problems associated with clamping of individual fibers as the number of fibers per unit area increases.

1.5 Such modifications are not described in this test method, and if they are made, they shall be acknowledged and clearly described in the report as deviations from the standard procedure.

1.6 In addition to a measure of the dry zero-span tensile strength of the specimen of fibers, an index of the cohesiveness of fibers in the sheet is also provided by the ratio of the tensile strength determined using Test Method D 828 and the tensile strength determined using this test method when all testing is done on handsheets having random fiber orientation **(1)**.²

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.

1.7 Two instrumental approaches for accomplishing the measurement of dry tensile strength at zero-span are described.

1.7.1 One approach is the use of specially constructed pair of “zero-span” jaws which are used in conjunction with a conventional tensile testing machine.

1.7.1.1 One such design for “zero-span” jaws was proposed by Clark **(1)**. A second design was proposed by Wink and Van Eperen **(2)**.

1.7.2 A second approach is the use of a special instrument incorporating both “zero-span” jaws and measurement and readout devices in a single instrument.³

1.7.3 When properly adjusted and calibrated, either of the instrumental approaches may be used to perform this test method.

1.8 *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 586 Test Method for Ash in Pulp, Paper, and Paper Products⁴

D 685 Practice for Conditioning Paper and Paper Products for Testing⁴

D 828 Test Method for Tensile Breaking Strength of Paper and Paperboard⁴

D 1193 Specification for Reagent Water⁵

D 1968 Terminology Relating to Paper and Paper Products⁴

D 5803 Test Method for Wet Tensile Strength at Zero-Span (“Wet Zero-Span Tensile”)⁴

2.2 TAPPI Test Methods:

³ One self-contained instrument suitable for making the measurements described in this test method is available from Pulmac Instruments International, Box 50, HCR 34, Montpelier, VT 05602. There may be other sources.

⁴ *Annual Book of ASTM Standards*, Vol 15.09.

⁵ *Annual Book of ASTM Standards*, Vol 11.01.