Designation: D1445/D1445M – 12

Standard Test Method for Breaking Strength and Elongation of Cotton Fibers (Flat Bundle Method)[1]

This standard is issued under the fixed designation D1445/D1445M; 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.

INTRODUCTION

The flat bundle test for cotton fiber strength gained immediate acceptance after its introduction in 1953. The first successful instrument was an inclined plane device with the beam calibrated in pounds. The specimen was clamped with no space between the jaws and was called zero-gauge strength. Results were expressed in Pressley Index (P.I.) calculated as the force-to-break in pounds divided by the bundle weight in mg. Obviously, P.I. is not a standard engineering unit.

Before the introduction of the flat bundle test, cotton fiber strength had been measured by the Chandler round bundle test (see former Method D414) and the results expressed in pounds per square inch [psi]. The U.S. Department of Agriculture obtained results from both instruments on specimens from the same samples of a large number of cottons. From this study, an empirical equation to express flat bundle test results in psi was:

$$\text{Breaking strength, 1000 psi} = (10.81106 \times \text{P.I.}) - 0.12$$

When it was shown that a finite gauge length test was more highly correlated with yarn strength than tests made at zero gauge length, the clamp design was modified to accommodate a ⅛ in. [3.2 mm] spacer. Selection of an engineering unit for reporting of results from ⅛ in. [3.2 mm] gauge tests presented a problem. However, the use of the tex for linear density and the introduction of a pendulum type instrument calibrated in kilograms led to the expression of results in grams-force per tex [gf/tex]. The clamp width without spacer is 11.81 mm and with spacer is 15.00 mm. The bundle of fibers is mounted across the clamp width and trimmed to the width. The bundle mass is mg/11.81 mm or mg/15.00 mm.

The use of the flat bundle test in domestic and international commerce has had a long and successful history. Correcting this error in the empirical relationship would have serious adverse affects in the textile industry. Therefore, the empirical relationship is retained to calculate zero gauge cotton fiber tensile strength designated as the Pressley strength in Eq 3 and 4 of D1445/D1445M.

1. Scope

1.1 This test method covers the determination of (*1*) the tensile strength or breaking tenacity of cotton fibers as a flat bundle using a nominal zero gauge length, or (*2*) the tensile strength or breaking tenacity and the elongation at the breaking load of cotton fibers as a flat bundle with ⅛-in. [3.2-mm] clamp spacing. This test method is applicable to loose ginned cotton fibers of untreated cottons whether taken before processing or obtained from a textile product.

1.2 This test method is designed primarily for use with special fiber bundle clamps and special strength testing instruments but may be used with other tensile strength and elongation testing machines when equipped with appropriate adapters to accommodate the fiber clamps.

NOTE 1—Other methods for measuring the breaking tenacity of fiber bundles include Test Method D1294, Test for Breaking Strength of Wool Fiber Bundles—1 in gauge Length;[2] and D5867, Test Method for Measurement of Physical Properties of Cotton Fibers by High Volume Instruments.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each

[1] This method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.11 on Cotton Fibers.

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[2] 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.

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