



# Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)<sup>1</sup>

This standard is issued under the fixed designation D2261; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope

1.1 This test method covers the measurement of the tearing strength of textile fabrics by the tongue (single rip) procedure using a recording constant-rate-of-extension-type (CRE) tensile testing machine.

1.1.1 The CRE-type tensile testing machine has become the preferred test apparatus for determining tongue tearing strength. It is recognized that some constant-rate-of-traverse-type (CRT) tensile testing machines continue to be used. As a consequence, these test instruments may be used when agreed upon between the purchaser and the supplier. The conditions for use of the CRT-type tensile tester are included in [Appendix X1](#).

1.2 This test method applies to most fabrics including woven fabrics, air bag fabrics, blankets, napped fabrics, knit fabrics, layered fabrics, pile fabrics and non-wovens. The fabrics may be untreated, heavily sized, coated, resin-treated, or otherwise treated. Instructions are provided for testing specimens with or without wetting.

1.3 Tear strength, as measured in this test method, requires that the tear be initiated before testing. The reported value obtained is not directly related to the force required to initiate or start a tear.

1.4 Two calculations for tongue tearing strength are provided: the single-peak force and the average of five highest peak forces.

1.5 The values stated in either SI units or inch-pound units are to be regarded as the standard. The inch-pound units may be approximate.

1.6 *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.*

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.60 on Fabric Test Methods, Specific.

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## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

D76 Specification for Tensile Testing Machines for Textiles

D123 Terminology Relating to Textiles

D629 Test Methods for Quantitative Analysis of Textiles

D1776 Practice for Conditioning and Testing Textiles

D2904 Practice for Interlaboratory Testing of a Textile Test Method that Produces Normally Distributed Data

D2906 Practice for Statements on Precision and Bias for Textiles<sup>3</sup>

D4848 Terminology Related to Force, Deformation and Related Properties of Textiles

D4850 Terminology Relating to Fabrics and Fabric Test Methods

## 3. Terminology

3.1 For all terminology relating to D13.60, Fabric Test Methods, Specific, refer to Terminology D4850.

3.2 For all terminology related to Force, Deformation and Related Properties of Textiles, refer to Terminology D4848.

3.2.1 The following terms are relevant to this standard: cross-machine direction, CD, fabric, machine direction, MD, peak force, in tear testing of fabrics, tearing force, in fabric, tearing strength, in fabric.

3.3 For all other terminology related to textiles, refer to Terminology D123.

## 4. Summary of Test Method

4.1 A rectangular specimen, cut in the center of a short edge to form a two-tongued (trouser shaped) specimen, in which one tongue of the specimen is gripped in the upper jaw and the other tongue is gripped in the lower jaw of a tensile testing machine. The separation of the jaws is continuously increased to apply a force to propagate the tear. At the same time, the

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Withdrawn. The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

force developed is recorded. The force to continue the tear is calculated from autographic chart recorders or microprocessor data collection systems.

## 5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing of commercial shipments since current estimates of between-laboratory precision are acceptable, and the test method is used extensively in the trade for acceptance testing.

5.1.1 In case of a dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are from a lot of fabric of the type in question. Test specimens then should be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using the appropriate statistical analysis and an acceptable probability level chosen by the two parties before testing is begun. If a bias is found, either its cause must be found and corrected, or the purchaser and the supplier must agree to interpret future test results with consideration to the known bias.

5.2 The force registered in a tear test is irregular, and as a consequence, empirical methods have had to be developed to obtain usable values related to tear strength. In spite of the empirical nature of the reported values, the values are considered to reflect comparative performance of similar fabrics tested and measured in the same way. No known procedure is available that can be used with all fabrics to determine the minimum tearing strength.

5.3 Depending on the nature of the specimen, the data recording devices will show the tearing force in the form of a peak or peaks. The highest peaks appear to reflect the strength of the yarn components, fiber bonds, or fiber interlocks, individually or in combination, needed to stop a tear in a fabric of the same construction. The valleys recorded between the peaks have no specific significance. The minimum tearing force, however, is indicated to be above the lowest valleys.

5.4 Most textile fabrics can be tested by this test method. Some modification of clamping techniques may be necessary for a given fabric due to its structure. Strong fabrics or fabrics made from glass fibers usually require special adaptation to prevent them from slipping in the clamps or being damaged as a result of being gripped in the clamps.

5.5 The CRE-type tensile testing machine has become the preferred test apparatus for determining tongue tearing strength. It is recognized that some constant-rate-of-traverse-type (CRT) tensile testing machines continue to be used. Consequently, these test instruments may be used when agreed upon between the purchaser and the supplier. The conditions for use of the CRT-type tester are included in [Appendix X1](#).

## 6. Apparatus

6.1 *Tensile Testing Machine*<sup>4</sup>, of the CRE-type conforming to the requirements of Specification [D76](#) with autographic recorder, or automatic microprocessor data gathering system.

6.2 *Clamps*, having all gripping surfaces parallel, flat, and capable of preventing slipping of the specimen during a test, and measuring at least 25 by 75 mm (1 by 3 in.) with the longer dimension perpendicular to the direction of application of the force.

6.2.1 The use of hydraulic or pneumatic clamping systems with a minimum of 25 by 75-mm (1 by 3-in.) rubber gripping surfaces or serrated having an appropriate clamping force at the grip faces depending on the type of fabric under test. The pressure should be sufficient to prevent slippage of the specimen in the gripping surface during the test, while ensuring the specimen is not damaged at the grip edge. Manual clamping is permitted providing no slippage of the specimen is observed.

6.2.2 For some materials, to prevent slippage when using jaw faces other than serrated, such as rubber-faced jaws, the jaw faces may be covered with a No. 80 to 120 medium-grit emery cloth. Secure the emery cloth to the jaw faces with pressure-sensitive tape.

6.3 *Cutting Die or Template*, having essentially the shape and dimensions shown in [Fig. 1](#).

## 7. Sampling and Test Specimens

7.1 *Lot Sample*—As a lot sample for acceptance testing, randomly select the number of rolls or pieces of fabric directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider the rolls or pieces of fabric to be the primary sampling units. In the absence of such an agreement, take the number of fabric rolls specified in [Table 1](#).

NOTE 1—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between rolls or pieces of fabric and between specimens from a swatch from a roll or piece of fabric to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

7.2 *Laboratory Sample*—For acceptance testing, take a swatch extending the width of the fabric and approximately 1 m (1 yd) along the machine direction from each roll or piece in the lot sample. For rolls of fabric, take a sample that will exclude fabric from the outer wrap of the roll or the inner wrap around the core of the roll of fabric.

7.3 *Test Specimens*—From each laboratory sampling unit, take five specimens from the machine direction and five specimens from the cross-machine direction, for each test condition described in [9.1](#) and [9.2](#), as applicable to a material specification or contract order.

7.3.1 *Direction of Test*—Consider the short direction as the direction of test.

7.3.2 *Cutting Test Specimens*—Cut rectangular specimens 75 by 200 mm ± 1 mm (3 by 8 in. ± 0.05 mm). Use the cutting die or template described in [6.3](#) and shown in [Fig. 1](#). Take the specimens to be used for the measurement of machine direction

<sup>4</sup> Apparatus is commercially available.