



Standard Test Methods for Testing Tire Cords, Tire Cord Fabrics, and Industrial Yarns Made From Glass Filaments¹

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1. Scope

1.1 These test methods cover the testing of industrial yarns made of glass filaments, cords twisted from such yarns, and fabric woven from such cords—products that are made specifically for use in the manufacture of pneumatic tires. By agreement, these test methods may be applied to similar glass yarns and cords used for reinforcing other rubber goods and for other industrial applications. The yarn or cord may be wound on cones, tubes, bobbins, spools, or beams, woven into fabric, or in other forms. These test methods include testing procedures only. These test methods do not include specifications or tolerances.

1.2 No procedure is included for the determination of fatigue resistance of cords, but several articles relating to the measurement of fatigue resistance of cords made from man-made filaments and cured in rubber were published in the bibliography of Test Methods [D885](#).

1.3 The following sections are included:

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¹ These test methods are under the jurisdiction of ASTM Committee [D13](#) on Textiles and are the direct responsibility of Subcommittee [D13.19](#) on Industrial Fibers and Metallic Reinforcements.

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1.4 These test methods show the values in both SI units and in inch-pound units. “SI units” is the technically correct name for the system of metric units known as the International System of Units. “Inch-pound units” is the technically correct name for the customary units used in the United States. The values stated in either acceptable metric units or other units shall be regarded separately as standard. The values expressed in each system may not be exact equivalents; therefore, each system must be used independently of each other without combining values in any way.

1.5 *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:²

- [D76](#) Specification for Tensile Testing Machines for Textiles
- [D123](#) Terminology Relating to Textiles
- [D578](#) Specification for Glass Fiber Strands
- [D885](#) Test Methods for Tire Cords, Tire Cord Fabrics, and Industrial Filament Yarns Made from Manufactured Organic-Base Fibers
- [D1423](#) Test Method for Twist in Yarns by Direct-Counting
- [D2258](#) Practice for Sampling Yarn for Testing
- [D4393](#) Test Method for Strap Peel Adhesion of Reinforcing Cords or Fabrics to Rubber Compounds
- [D4848](#) Terminology Related to Force, Deformation and Related Properties of Textiles
- [D6477](#) Terminology Relating to Tire Cord, Bead Wire, Hose Reinforcing Wire, and Fabrics

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms related to tire cord, bead wire, hose wire, and tire cord fabrics, refer to Terminology [D6477](#).

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.

3.1.1.1 The following terms are relevant to this standard: catenary length, cord twist, dip, dip pickup, in textile cord or fabric, industrial yarn, standard atmosphere for testing textiles, tabby sample, tire cord, and tire cord fabric.

3.1.2 For definitions of terms related to force and deformation in textiles, refer to Terminology **D4848**.

3.1.2.1 The following terms are relevant to this standard: breaking force, breaking tenacity, initial modulus, tensile strength.

3.1.3 For definitions of other terms related to textiles, refer to Terminology **D123**.

3.1.3.1 The following terms are relevant to this standard: fabric

3.2 Abbreviations:

3.2.1 *CRE*—constant-rate-of-extension

4. Summary of Test Methods, General

4.1 A summary of the directions prescribed for the determination of specific properties is stated in the appropriate sections of specific test methods or the referenced standard.

5. Significance and Use

5.1 The procedures in these test methods may be used for the acceptance testing of commercial shipments, but caution is advised because technicians may fail to get good agreement between results on certain yarns, cords, or fabrics. Comparative tests as directed in Section **5.1.1** may be advisable.

5.1.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, test samples should be used that are as homogeneous as possible, that are drawn from the material from which the disparate test results were obtained, and that are randomly assigned in equal numbers to each laboratory for testing. Other materials with established test values may be used for this purpose. The test results from the two laboratories should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If a bias is found, either its cause must be found and corrected, or future test results for that material must be adjusted in consideration of the known bias.

5.2 The significance and use of particular properties are discussed in the appropriate sections of the specific test methods.

SAMPLING AND CONDITIONING

6. Sampling of Yarn and Cord

6.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping cases or beams directed in an applicable material specification or Practice **D2258**. Consider shipping cases to be the primary sampling unit.

6.2 Laboratory Sample:

6.2.1 *Yarn or Cord in Cases*—As a laboratory sample for acceptance testing, select packages at random from each shipping case in the lot sample. Take the number of packages for the laboratory sample as directed in an applicable material

specification or Practice **D2258**. Preferably, the same number of packages should be taken from each shipping case in the lot sample. If differing numbers of packages are to be taken from shipping cases in the lot sample, the cases from which a specific number of packages are to be drawn should be determined at random.

6.2.2 *Yarn on Beams*—As a laboratory sample for acceptance testing, select ends at random from each beam in the lot sample. Take the number of ends for the laboratory sample as directed in an applicable material specification or Practice **D2258**. Wind the laboratory samples on a tube or spool using a winder with a tension of 5 ± 1 mN/tex [0.05 ± 0.01 gf/den] using the general technique directed in Practice **D2258**.

6.2.2.1 Take laboratory samples from the outside of the beams unless there is a question or disagreement about a shipment. In that case, take laboratory samples after removing a radial depth of 6 mm [$\frac{1}{4}$ in.] or more to minimize the effects of handling and atmospheric changes that occurred during shipment or storage. Place the laboratory samples in a moisture resistant container to protect them from atmospheric changes until the yarn is conditioned in the atmosphere for testing tire cords and industrial yarns.

6.3 *Test Specimens*—Take the number of specimens from each laboratory sampling unit as directed in each test method.

6.3.1 *Preparation of Specimens*—Unwind and discard at least six layers of yarn or cord from the package to eliminate ultraviolet and physically damaged material (except from beams). If specimens are not taken directly from the original package, it is advisable to wind the sample on a tube or spool by means of a winder using a tension of 5 ± 1 mN/tex [0.05 ± 0.01 gf/den]. If the specimen is collected as a loosely wound package, or in the form of a skein, report that the observed results were determined on a relaxed sample. Use care in handling the specimen. Discard any specimen subjected to any change of twist, kinking or making any bend with a diameter less than 6 mm [$\frac{1}{4}$ in.]. Place the specimen in a moisture resistant polyethylene bag or other moisture resistant container to protect it from atmospheric changes until ready to condition in the atmosphere for testing industrial yarns and tire cords.

6.3.2 If the yarn or cord has been treated with a resorcinol-formaldehyde-latex (RFL) type adhesive, samples should be protected against exposure to ultraviolet light, high humidity (over 60 % relative humidity) and high temperature (over 38°C [100°F]).

7. Sampling of Tire Cord Fabric

7.1 *Lot Sample*—As a lot to be sampled for acceptance testing, take tire cord fabric produced on only one loom creel. As a primary sampling unit, select one roll of fabric from the lot and prepare tabby sample to yield the laboratory sampling units as directed in Section **7.2**.

7.2 *Preparation of Laboratory Sample*—Take a sample equal to the length of cord between the regular tabby woven at the end of the roll and a special tabby woven a short distance from the end when the roll of fabric is manufactured. For rolls that do not have a special woven tabby, improvise a tabby by the use of gummed tape or strips of cemented fabric applied across a section of the cord fabric. The length of the tabby