Designation: D 6477 – 04

Standard Terminology Relating to Tire Cord, Bead Wire, Hose Reinforcing Wire, and Fabrics[1]

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1. Scope

1.1 This terminology is the compilation of all definitions developed by Subcommittee D13.19 on Tire Cords and Fabrics.

1.2 The terminology, mostly definitions, is unique to the tire cord fabric industry. Meanings of the same terms used outside the tire cord fabric industry can be found in other compilations or in dictionaries of general usage.

1.3 In addition to being a specialized dictionary, this terminology is also a tool for managing the Subcommittee's terminology. This includes finding, eliminating, and preventing redundancies, that is, where two or more terms relating to the same concept are defined in different words.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D 123 Terminology Relating to Textiles
D 885 Test Methods for Tire Cords, Tire Cord Fabrics, and Industrial Filament Yarns Made from Manufactured Organic-Base Fibers
D 1871 Test Methods for Adhesion of Single-Filament Steel Wire to Rubber
D 2229 Test Method for Adhesion Between Steel Tire Cords and Rubber
D 2692 Test Method for Air Wicking of Tire Fabrics, Tire Cord Fabrics, Tire Cord, and Yarns
D 2969 Test Methods for Steel Tire Cords
D 2970 Test Methods for Tire Cords, Tire Cord Fabrics, and Industrial Yarns Made from Glass Filaments
D 4393 Test Method for Strap Peel Adhesion of Reinforcing Cords or Fabrics to Rubber Compounds
D 4776 Test Method for Adhesion of Tire Cords and Other Reinforcing Cords to Rubber Compounds by H-Test Procedure
D 4974 Test Method for Hot Air Thermal Shrinkage of Yarn and Cord Using a Thermal Shrinkage Oven
D 4975 Test Methods for Single-Filament Tire Bead Wire Made from Steel
D 5591 Test Method for Thermal Shrinkage Force of Yarn and Cord with the Testrite Thermal Shrinkage Force Tester
D 6320 Test Methods for Single Filament Hose Reinforcing Wire Made from Steel

3. Terminology

adhesion, *n*—the property denoting the ability of a material to resist delamination or separation into two or more layers. **D 1871, D 4393, D 4776**

adhesion, *n—in tire fabrics,* the force required to separate a textile material from rubber or other elastomer by a definite prescribed method. **D 2229, D 4393, D 4776**

adhesive treated tire cord, *n*—a tire cord whose adhesion to rubber or other elastomer has been improved by the application of a dip followed by rapid drying and (normally) additional heat treatment. **D 5591**

air wicking, *n—in tires,* the passage of air longitudinally along or through yarns in a fabric that has been encased and cured in rubber or other elastomer, that is, air permeability in the plane of the fabric. **D 2692**

breaking force, *n*—the maximum force applied to a material carried to rupture.

DISCUSSION—Materials that are brittle usually rupture at the maximum force. Materials that are ductile are usually capable of withstanding the maximum force without rupturing. For many years, it has been the usual practice in the tire industry and related industries to use the term *breaking strength* to characterize yarn and cord of a specified size and type without consideration of their unit size. Numerically, *breaking strength* is equal to breaking force for the same specimen. The average of the breaking forces observed on two or more specimens of a specific sample is referred to as the sample breaking strength, which is the property used in engineering calculations for a specific textile material. *Tensile strength* and *breaking tenacity*are derived or calculated values for materials that include consideration of the unit size of the materials. These terms can be used to compare intrinsic strengths of yarns and cords of different sizes or different materials. The term *tensile strength*,

[1] This terminology is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.19 on Tire Cord and Fabrics.

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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.

in MPA (psi), is not synonymous hit either *breaking force* or *breaking strength*, in N (lbf), or breaking tenacity, in mN/tex (gf/den). D 885, D 2970D 4975D 6320

breaking strength, *n*—a strength expressed in terms of breaking force.

DISCUSSION— Breaking strength is particularly significant as the characteristic of a sample as distinct from a specimen, and is usually expressed as newtons (N) or pounds-force (lbf). See discussion for *breaking force*.
(D 885)

breaking tenacity, *n*—the tenacity at the breaking force.

DISCUSSION—See discussion for *breaking force*.
D 885, D 2970

catenary length, *n*—the difference between the length of the shortest and the longest component in a plied yarn or cables cord after twisting. **D 2970**

chafer fabric, *n*—woven fabric, usually coated with unvulcanized rubber, which is laid around the bead of a tire before vulcanization.

DISCUSSION—Chafer fabric is used to reinforce the outer layer of rubber on the tire bead to provide an abrasion resistant surface in contact with the wheel rim. In the case of tubeless tires, the chafer fabric is usually made wickproof to prevent air leaking from the inflated tire. **D 2692, D 4393**

cord, *n*—a twisted or formed structure composed of one or more single or plied filaments, strands, or yarns of organic polymer or inorganic materials.

DISCUSSION—Cord, as used in these test methods, is used for the manufacture of pneumatic tires or other industrial fabrics. The direction of twist used to combine the single or plied yarn elements into a cord construction is in the direction opposite to that used in the yarns. Frequently, tire and other reinforcing cords consist of a single yarn strand having little or no twist. These cords as well as single monofilaments, are used synonymously with twisted and plied cords in this test method. **D 885, D 4776, D 5591**

cord twist, *n*—the amount of twist in a cord made from two or more single or plied yarns.

DISCUSSION—Cord twist is based on the initial length of a cord specimen. Cord twist is expressed as the number of turns divided by the length of the untwisted cord. **D 885, D 2970**

core, *n*—a filament or strand that serves as an extended axis about which other elements can be wound. **D 2969**

curing, *n*—see the preferred term **vulcanization**. **D 1871, D 4393, D 4776**

dip, *n*—a chemical composition that is applied to a textile cord or fabric to improve its adhesion to rubber or other elastomer. **D 885, D 2970**

dip pick-up, *n*—the amount of dip or dip components present in a textile cord or fabric after processing, expressed as a percentage of the mass of the oven-dried dip-free material. **D 885, D 2970**

direction of lay, *n*—the helical disposition of the components of a strand or cord.

DISCUSSION—The strand or cord has an "S" or left hand lay if, when held vertically, the spirals around the central axis of the strand or cord conform in the direction of slope to the central portion of the letter "S"; and "Z", or righthand lay, if the spirals conform in direction of slope to the central portion of the letter "Z". **D 2969**

direction of twist, *n*—see **direction of lay**. **D 2969**

elongation, *n*—the ratio of the extension of a material to the length of the material prior to stretching.

DISCUSSION—Elongation may be measured at any specified force or at rupture. **D 885, D 6320**

fabric , *n*— *in textiles,* a planar structure consisting of yarns or fibers.

DISCUSSION—In tire cord, fabrics are produced with tire cord warp yarns interlaced with widely spaced filling yarns. **D 885, D 2970**

fabric dip, *n*—for *tire fabrics,* a chemical composition which is applied to a textile cord or fabric to improve its adhesion to rubber compounds. **D 4393**

flare, *n*—the spreading of the filament ends or the strand ends at the cut end of a steel tire cord, expressed as the unraveled length. **D 2969**

greige cord, *n*—*in tire cords,* a cord that has not been adhesive treated, heat treated, or otherwise treated before use (see *cord*). **D 4974, D 5591**

greige tire cord, *n*—a tire cord that has not been dip treated or heat treated before use (see *tire cord*). **D 5591**

growth, *n*—the increase one or more dimensions of an object or a material.

DISCUSSION—The increase in length of a specimen caused by the application of a continuing load or force under specified conditions. **D 885**

high elongation, *adj*—*in steel tire cord*, a cord with an average elongation at break greater than 3.0 %. **D 2969**

holland cloth, *n*—a completely filled woven fabric having a smooth gloss finish on both sides used as a separating medium for sheeted rubber compounds. **D 1871, D 4393**

hose reinforcing wire, *n*—a single filament of steel wire with a metallic coating (usually brass) used in the reinforcement of a rubber or other elastomer hose. **D 1871, D 6320**

H-test adhesion, *n*—the force to extract either end of a textile cord structure that is embedded in a rubber compound under specified conditions. **D 4776**

industrial yarn, *n*—a yarn composed of continuous filaments, usually of high breaking tenacity, produced with or without twist, and intended for applications in which functional properties are of primary importance; for example, in reinforcing material in elastomeric products (tires, hose, belting), in protective coverings, and in cordage and webbing, and so forth. **D 885, D 2970, D 4776**

initial modulus, *n*—the slope of the initial straight portion of a stress-strain (or force elongation) curve.

DISCUSSION—Modulus is the ratio of the change in tenacity, expressed in millinewtons per tex (mN/tex) or grams-force per denier (gf/den) to the change in strain, expressed as a fraction of the original length. In the case of a tenacity elongation curve, the following equation is used to calculated the initial modulus: *initail modulus* = (*tencaity/percent elongation*) × 100 **D 885, D 2970**