



Standard Test Method for Adhesion Between Tire Bead Wire and Rubber¹

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1. Scope

1.1 This test method covers procedures for testing the strength of adhesion of single-filament wire to vulcanized rubber compounds. The method applies to, but is not limited to, wire made from brass, bronze, or zinc coated steel wire. The adhesion strength is expressed as the magnitude of the pull-out force for the single filament of wire.

1.2 This test method is applicable to single-filament wires used in reinforced rubber products as single filaments and is normally used to evaluate the adhesion of samples of wire to a standard rubber applied under specified conditions. It is primarily used to evaluate tire bead wire and may be applied, with modifications and by agreement between supplier and customer, to various wire types used in rubber product reinforcing.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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. See 6.5.1.*

2. Referenced Documents

2.1 ASTM Standards:²

D76 Specification for Tensile Testing Machines for Textiles

D123 Terminology Relating to Textiles

D1566 Terminology Relating to Rubber

D2906 Practice for Statements on Precision and Bias for Textiles (Withdrawn 2008)³

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.19 on Industrial Fibers and Metallic Reinforcements.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.

D3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets

D4392 Terminology for Statistically Related Terms (Withdrawn 1993)³

D6477 Terminology Relating to Tire Cord, Bead Wire, Hose Reinforcing Wire, and Fabrics

E456 Terminology Relating to Quality and Statistics

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms relating to tire cord, bead wire, hose wire, and tire cord fabrics, refer to Terminology D6477.

3.1.1.1 The following terms are relevant to this standard: adhesion, curing, holland cloth, hose reinforcing wire, mill grain, rubber, rubber compound, as used in the manufacture of rubber articles, tire bead, tire bead wire, and vulcanization.

3.1.2 For definitions of terms relating to rubber, refer to Terminology D1566.

3.1.3 For definitions of terms relating to testing and statistical concepts, refer to Terminology D4392 or E456/D4392E456.

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

4. Summary of Test Methods

4.1 The wires are vulcanized into a block or pad of rubber and the force necessary to pull the wires out of the rubber is measured. The direction of pull-out is axial, that is, along the wire.

5. Significance and Use

5.1 To contribute to the mechanical properties required in a product, tire bead wire must have good adhesion to the rubber matrix. This allows the rubber to absorb part of the energy, distributing it uniformly between the reinforcing material and the rubber compound. This test method is considered satisfactory for acceptance testing of commercial shipments of wire since it has been used extensively in the trade for this purpose. This test method may be used for purchase specification requirements or manufacturing control of bead wire.

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