



Standard Test Methods for Rubber Deterioration—Dynamic Fatigue¹

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

1. Scope

1.1 These test methods cover testing procedures that estimate the ability of soft rubber compounds to resist dynamic fatigue. No exact correlation between these test results and service is given or implied. This is due to the varied nature of service conditions. These test procedures do yield data that can be used for the comparative evaluation of rubber compounds or composite rubber-fabric materials for their ability to resist dynamic fatigue.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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:

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension²

D 1349 Practice for Rubber—Standard Temperatures for Testing²

D 1682 Test Methods for Breaking Load and Elongation of Textile Fabrics³

D 3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products²

3. Summary of Test Methods

3.1 Three test methods are covered, using the following different types of apparatus:

3.1.1 *Method A*—Scott Flexing Machine.

3.1.2 *Method B*—De Mattia Flexing Machine.

3.1.3 *Method C*—E. I. du Pont de Nemours and Co. Flexing Machine.

3.1.4 The Scott flexing machine is used principally for tests

of Type I, the De Mattia flexing machine for tests of Type II, while the du Pont apparatus is adapted to tests of either Type I or II.

4. Significance and Use

4.1 Tests for dynamic fatigue are designed to simulate the continually repeated distortions received in service by many rubber articles, such as tires, belts, footwear, and various molded goods. These distortions may be produced by extension, compressive, and bending forces or combinations of them. The effect of the distortions is to weaken the rubber until surface cracking or actual rupture occurs. In the case of combinations of rubber with other flexible material such as fabric, the effect may be evidenced by separation at the interface between the materials, caused either by breaking of the rubber or failure of the adhesion or both.

4.2 These tests are, therefore, of the following two types:

4.2.1 *Type I*—Tests designed to produce separation of rubber-fabric combinations such as are used in belts and tires, involving controlled bending of the specimens.

4.2.2 *Type II*—Tests designed to produce cracking on the surface of rubber by either repeated bending or extension as occurs in service with parts such as tire treads and sidewalls, rubber soles, and shoe uppers, diaphragms, hose covers, etc.

5. Application

5.1 In case of conflict between the provisions of these methods and those of detailed specifications or methods of test for a particular material, the latter shall take precedence.

6. Preparation of Specimen

6.1 Except as may be otherwise specified in these test methods, the requirements of Practice D 3183 shall be complied with and are made a part of these methods.

7. Temperature of Test

7.1 The standard temperature for testing shall be $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$). Specimens shall be conditioned for at least 12 h. Controlled temperatures outside the standard range are acceptable and often desirable. Special note of such temperatures shall appear in the report.

NOTE 1—The standard test temperature herein specified is the same as that prescribed for the Standard Laboratory Atmosphere in Practice D 1349. Any changes or revisions hereafter in Practice D 1349 relating to

¹ These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.15 on Degradation Tests.

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² *Annual Book of ASTM Standards*, Vol 09.01.

³ *Annual Book of ASTM Standards*, Vol 07.01.