



Standard Test Method for Rubber Deterioration by Heat and Air Pressure¹

This standard is issued under the fixed designation D 454; 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 (ϵ) 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 describes a procedure to determine the influence of elevated temperature and air pressure on the physical properties of vulcanized rubber. The results of this test may not give an exact correlation with service performance since performance conditions vary widely. The test may, however, be used to evaluate rubber compounds on a laboratory comparison basis. It will be most applicable to performance under conditions of increased temperature and air pressure.

NOTE 1—For evaluating rubber vulcanizates under less severe conditions that more nearly approach natural aging, the use of Test Methods D 573 and D 865 is recommended.

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 572 Test Method for Rubber—Deterioration by Heat and Oxygen²
- D 573 Test Method for Rubber—Deterioration in an Air Oven²
- D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets²
- D 3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products²
- D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries²

3. Summary of Test Method

3.1 Specimens of vulcanized rubber are exposed to the deteriorating influence of air at specified elevated temperature and pressure for known periods of time, after which their physical properties are determined. These are compared with the properties determined on the original specimens and the changes noted.

3.2 Unless otherwise specified, the determination of the physical properties shall be carried out in accordance with Test Methods D 412.

3.3 Except as may be otherwise specified in this test method, the requirements of Practices D 3182 and D 3183 shall be complied with and are made part of this test method.

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

4. Significance and Use

4.1 Rubber and rubber products must resist the deterioration of physical properties with time caused by oxidative and thermal aging. This test method allows these performance properties to be determined under the accelerated conditions of high air pressure and at elevated temperatures.

4.2 Refer to the annex in Test Method D 573 for important information on standard compounds used for precision testing for accelerated test aging evaluation.

5. Apparatus

5.1 *Air-Pressure Chamber*, consisting of a metal vessel designed to maintain an internal atmosphere of air under known pressure, with provisions for placing rubber specimens within it and subjecting them to controlled uniform temperature. The equipment shall conform to the following requirements:

5.1.1 The size and shape of the chamber shall be optional, but shall be such that the specimens may be suspended therein vertically without undue crowding and without touching each other or the sides of the chamber.

5.1.2 The operating temperature shall be $125 \pm 1^\circ\text{C}$ ($257 \pm 1.8^\circ\text{F}$) determined as described in 5.1.5. The temperature shall be automatically controlled by means of thermostatic regulation.

5.1.3 The source of heat is optional, but if located inside the

¹ This test method is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.15 on Degradation Tests.

Current edition approved Nov. 11, 1999. Published December 1999. Originally published as D 454 – 52. Last previous edition D 454 – 88 (1994) ^{ϵ 1}.

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