



Standard Test Method for Rubber—Deterioration by Heat and Oxygen¹

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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 relative deterioration resistance of vulcanized rubber in a high temperature and high pressure oxygen environment. There may be no exact correlation between this accelerated test and natural aging of rubber because of the varied conditions of natural aging. This accelerated test is suitable for laboratory compound or product comparisons.

NOTE 1—For evaluating rubber vulcanizates under less severe conditions more nearly approaching 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. (For specific precautionary statement, see Note 2.)*

2. Referenced Documents

2.1 ASTM Standards:

- D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension²
- D 454 Test Method for Rubber Deterioration by Heat and Air Pressure²
- D 573 Test Method for Rubber—Deterioration in an Air Oven²
- D 865 Test Method for Rubber—Deterioration by Heating in Air (Test Tube Enclosure)²
- 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 a deteriorating influence at a specified elevated temperature and oxygen 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 provides a way to assess these performance characteristics of rubber, under certain accelerated conditions as specified.

4.2 Please 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. Oxygen-Pressure Vessel

NOTE 2—**Caution:** Adequate safety provisions are important when heating oxidizable organic materials in oxygen since the rate of reaction may become very rapid in some cases, particularly if large surface area is exposed, and very high pressures may be developed. If the same equipment is used for the oxygen-pressure test and the air-pressure heat test, Test Method D 454, care must be exercised to see that the thermostatic controls are properly set, since the specimens may react very rapidly with oxygen at the temperature of the air-pressure heat test. Liquids acceptable as heating media for one test may be hazardous when used for the other test.

5.1 The oxygen-pressure chamber shall consist of a metal vessel designed to retain an internal atmosphere of oxygen gas under pressure, with provisions for placing rubber specimens within it and subjecting the whole to controlled uniform temperature. Because of the superior temperature control and heat transfer, metal vessels completely immersed in a liquid medium are recommended for purposes of referee tests. The

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