



Designation: D 3395 – 99

Standard Test Methods for Rubber Deterioration—Dynamic Ozone Cracking in a Chamber¹

This standard is issued under the fixed designation D 3395; 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.

1. Scope

1.1 These test methods are used to estimate the cracking resistance of vulcanized rubber exposed under dynamic strain conditions to a chamber atmosphere containing ozone at a fixed partial pressure. The effect of sun or ultraviolet light is excluded.

1.2 These test methods are not applicable to materials ordinarily classed as hard rubber, but are adaptable to molded or extruded soft rubber.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For a specific hazard statement, see Note 1 and 5.1.*

NOTE 1—**Warning—Ozone is a hazardous chemical.**

2. Referenced Documents

2.1 ASTM Standards:

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber²

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets²

D 4575 Test Methods for Rubber Deterioration—Reference and Alternative Method(s) for Determining Ozone Level in Laboratory Test Chambers²

3. Summary of Methods

3.1 The methods appear as follows:

	Sections
Method A—Tensile Elongation	5 to 8
Method B—Belt Flex	9 to 12

¹ These test methods are under the jurisdiction of ASTM Committee D-11 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.

3.2 In Method A, rectangular test specimens are subjected to dynamic maximum amplitude tensile strain of $25 \pm 3\%$ at a fixed frequency of 0.5 Hz (30 cpm). In Method B, flat-sheet test specimens are affixed to a fabric belt and the belt is run over a set of two pulleys that induce a surface strain (due to the bending) during passage over the pulleys.

3.3 Refer to Test Method D 4575 for the reference and optional alternative methods for the measurement of the ozone partial pressure in laboratory test chambers.

4. Significance and Use

4.1 The significance of these tests is mainly in their ability to differentiate, in a comparative sense, between different degrees of ozone resistance under the limited and specified conditions of the accelerated tests.

4.2 These test methods may not give results correlating exactly with outdoor exposure tests or service performance since the correlation of accelerated ozone tests with such performance is highly dependent upon the specific conditions of both the accelerated ozone and outdoor exposures. Conditions that influence the accelerated tests are ozone partial pressure, air flow, temperature, stress-relaxation, and the bloom of additives.

4.3 Outdoor or service performance is influenced by such weather conditions as rainfall, ambient temperature, sun light, and the strain cycles imposed.

METHOD A—TENSILE ELONGATION TEST

5. Hazards

5.1 **Warning—Ozone is a hazardous substance. Consult and follow all applicable laws, rules, and regulations regarding exposure to ozone.**

6. Apparatus

6.1 Flexing Device:³

6.1.1 The device used for this test consists of a flexing framework, a motor with gear head reducer, and an eccentrically driven vertical shaft with a reciprocating stroke of 25 mm

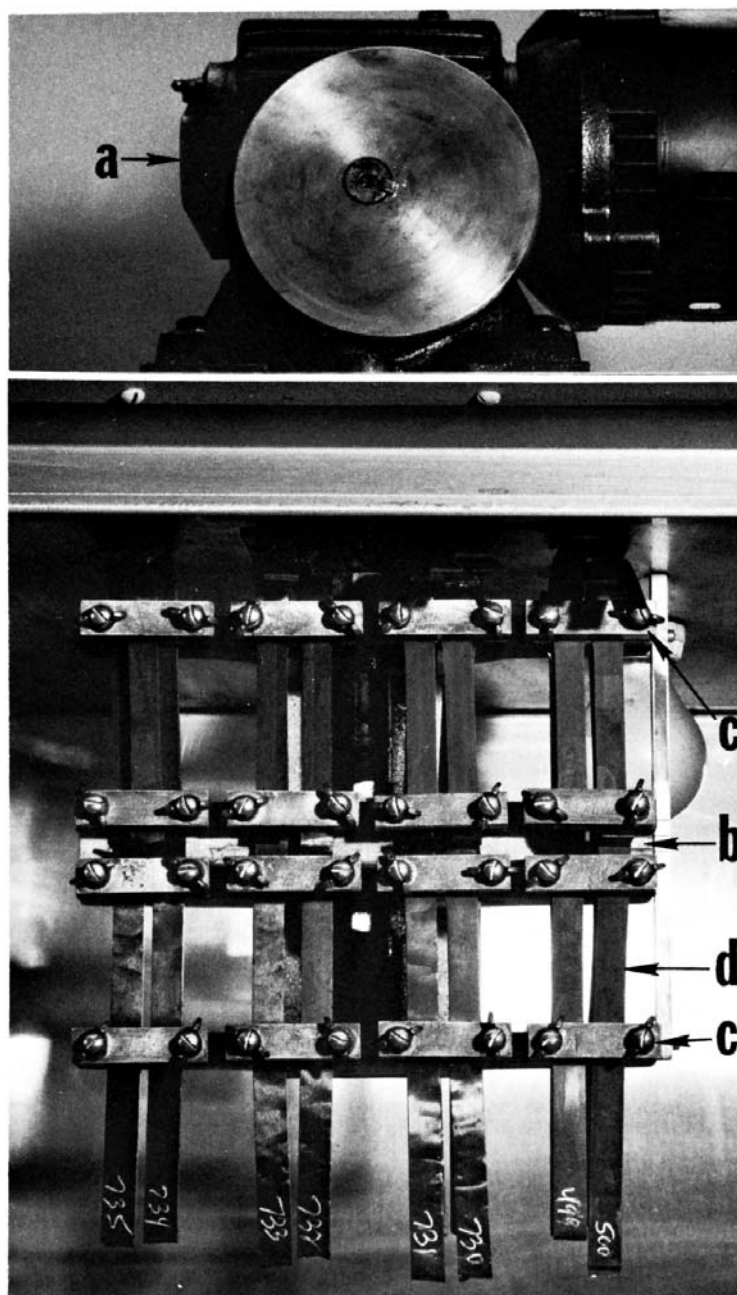
³ Model 701-1 Flexer, available from the Mast Development Co., Inc., 2212 E. 12th St., Davenport, IA 32803, has been found satisfactory for this method.

(1 in.). To the end of this shaft, a parallel bar is attached and to this a series of four dual clamps. Above and below the traveling bar are two stationary bars that contain four clamps each. These constitute the flexing framework.

6.1.2 The action of the flexing apparatus is to impart a straight-line motion to the clamps holding the test specimens; four specimens on the top bar, four on the bottom bar. This

motion is in the plane of the common centerline of each set of opposing grips (see Fig. 1).

6.2 *Ozone Chamber*—The ozone chamber shall conform to the requirements specified in Test Method D 1149. It shall be equipped to permit flexing of the specimens from 0 to $25 \pm 3\%$ extensions at a rate of 0.5 Hz (30 cpm).



Method A

a—gear head and eccentric drive

b—traveling bar with specimen clamps, driven through roof of ozone chamber

c—stationary bars with specimen clamps

d—specimens

FIG. 1 Dynamic Strain Ozone Tester