NOTICE: This standard has either been superseded and replaced by a new version or withdrawn.
Contact ASTM International (www.astm.org) for the latest information

Designation: D 750 – 00

Standard Test Method for Rubber Deterioration in Carbon—Arc Weathering Apparatus[1]

This standard is issued under the fixed designation D 750; 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 covers specific variations in the test conditions and procedures which shall be applicable when Practice G 151[2] plus either of Practices G 152[2] or G 153[2] are employed for exposure of vulcanized rubber compounds. It also covers the preparation of test specimens and the evaluation of results.

1.2 The values stated in SI units are to be regarded as the standard.

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—Tension[3]

D 925 Test Methods for Rubber Property—Staining of Surfaces (Contact, Migration, and Diffusion)[3]

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets[3]

D 3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products[3]

D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries[3]

G 151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices That Use Laboratory Light Sources[2]

G 152 Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials[2]

G 153 Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials[2]

G 155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials[2]

3. Significance and Use

3.1 This test method describes procedures to use in determining the effects of an open-flame carbon-arc light source, an enclosed carbon-arc light source, or a xenon-arc light source along with heat and moisture on rubber specimens held in a jig or holder with or without a specified strain. The purpose is to attempt to accelerate the effects produced by light, heat, and moisture in the natural environment. Exposures are not intended to simulate the deterioration caused by localized weather phenomena, such as atmospheric pollution, biological attack, and saltwater exposure. The Significance and Use section in Practice G 151 and the standard for the appropriate apparatus, that is, Practices G 152, or G 153 should be consulted for additional information on significance and use of the exposure tests.

3.2 The primary criterion used in estimating resistance to light aging is the percentage decrease in tensile strength and in elongation at break. A supplementary criterion for estimating resistance to light aging is the observed extent of surface crazing and cracking.

3.3 Results obtained by use of this test method should not be represented as equivalent to those of any natural exposure test until the degree of quantitative correlation has been established for the material in question.

3.4 Practices G 151, G 152, and G 153 recommend that a similar material of known performance (a control) be exposed simultaneously with the test specimen to provide a standard for comparative purposes. Preferably, a control material known to have poor durability as well as one that has good durability should be used. The reason for using a control is that reproducibility in ranking stabilities is usually better than reproducibility of absolute changes. Therefore, the use of controls is particularly important when test materials are not being compared with one another.

---

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

Current edition approved Dec. 10, 2000. Published March 2001. Originally published as D 750 – 43. Last previous edition D 750 – 95.

[2] *Annual Book of ASTM Standards*, Vol 14.04.

[3] *Annual Book of ASTM Standards*, Vol 09.01.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.

4. Apparatus

4.1 The preferred exposure apparatus conforms with Practice G 152.

4.2 Apparatus conforming with Practice G 153 may be used by mutual consent of the concerned parties. It shall be understood that results obtained from different types of apparatus may not be directly comparable due to spectral differences in the radiant energy emitted by the two types of carbon arcs.

5. Test Specimens

5.1 Unless otherwise mutually agreed upon, test specimens prepared especially for this test or cut from the material to be evaluated shall be three tension test replicates prepared in accordance with Practices D 3182 and D 3183. An additional three tension test replicates shall be prepared and stored for testing in accordance with 7.1.3. Unless otherwise mutually agreed upon, the specimens should have a maximum thickness of 0.75 mm (0.030 in.) and a minimum thickness 0.60 mm (0.025 in.).

5.2 If evaluation is limited only to visual observation, then specimens of any thickness may be used and the thickness shall be included in the report. Dimensions of the specimens are not critical but previous practice called for specimens 75 mm (3 in.) wide by 150 mm (6 in.) in length.

5.3 Exposing duplicate sets of test specimens whenever possible is recommended.

5.4 Specimens cut from rubber products may be buffed.

6. Procedure

6.1 Unless otherwise mutually agreed upon or specified Method 1—Continuous Exposure to Light and Intermittent Exposure to Water Spray of Practice G 151 shall be used.

6.2 Firmly fasten the test specimens in a jig or holder that permits exposure either with or without elongation.[4] While exposures are usually made without elongation of the test specimen, when mutually agreed upon, any specified amount of elongation may be employed but this must be reported in the results of the test.

6.3 The general procedure of Practice G 151 shall be followed.

6.3.1 Black panel temperature shall be controlled at 63 ± 3°C maximum during the dry period.

6.3.2 Unless otherwise mutually agreed upon or specified operate with a cycle cam of 102 min light followed by 18 min of water spray and light. (see Note 1.)

NOTE 1—This cycle is recommended only because it has long historical usage, not because it has been established for technical reasons as superior.

6.3.3 The apparatus shall be operated with all optical filters in place.

6.4 Test for the presence of ozone in the testing unit adjacent to the exposed specimen by exposing a small filter paper previously dipped in starch-potassium iodide solution. Ozone, if present, will cause the test paper to turn blue. The length of time required for the formation of a deep blue coloration may be taken as an indication of the quantity of ozone present. Shield the test paper from the light source.

6.5 An alternative test[4] for the presence of ozone may be made as follows:

6.5.1 Select a 25 by 75 mm (1.0 by 3.0 in.) sample of the control stock of the material being exposed and stretch to an elongation of 25 %.

6.5.2 Place the sample in the artificial light and water exposure apparatus at the position of the irradiated specimens but shielded from the direct rays of the arc. If available, expose a 25 by 75 by 2.5 mm (1.0 by 3.0 by 0.1 in.) sample of natural rubber or SBR black tire tread compound similarly and simultaneously.

6.5.3 Report the time of exposure necessary to form the first visible cracks to indicate the ozone concentration. Also report the number and type of cracks.

NOTE 2—When desired or by mutual agreement the light source may be periodically monitored with an ultraviolet light radiometer in accordance with Test Methods D 925.

6.6 The periods of exposure shall be determined by one of the following procedures:

6.6.1 A mutually agreed upon specified number of hours,

6.6.2 The number of hours of exposure required to produce mutually agreed upon minimum acceptable changes in either the test specimen or an agreed upon standard sample, or

6.6.3 The number of hours of exposure required to produce a mutually agreed upon minimum amount of change in the exposed test specimen.

7. Interpretation of Results

7.1 The effects of exposure shall be determined in the following manner:

7.1.1 At the conclusion of the exposure interval the specimens shall be removed from the exposure test apparatus and examined visually for indications of crazing and cracking. The number and degree of cracks and crazes shall be reported by a mutually agreed upon method.

7.1.2 The tensile strength and ultimate elongation of these replicates shall be determined in accordance with Test Methods D 412.

7.1.3 For the purpose of comparison, tensile strength and elongation of duplicate unexposed specimens of the same material shall be determined at the time the exposed replicates are tested.

8. Report

8.1 In addition to the report requirements of Practices G 152, G 153 and G 155, report the following additional information:

8.1.1 Any variations from the specified conditions,

8.1.2 Description and dimensions of specimens,

8.1.3 Number of cracks and degree of crazing or cracking of the specimens,

8.1.4 Percentage of elongation during exposure, if any,

8.1.5 Tensile strength in kilopascals (or pounds-force per square inch) before and after exposure,

[4] There are also several commercial ozonometers available for monitoring the ozone concentration.

8.1.6 Ultimate elongation at break before and after exposure,

8.1.7 Percentage loss in tensile strength as a result of exposure,

8.1.8 Percentage loss in elongation at break as a result of exposure,

8.1.9 Indication of ozone, and

8.1.10 Chlorine content of the water.

9. Precision and Bias

9.1 Precision and bias statements will be prepared in the form specified by Practice D 4483. They will be added to this test method when they are completed.

10. Keywords

10.1 carbon arc; rubber products; ultraviolet light aging; weathering

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).