Designation: D3854 – 90 (Reapproved 2010)

Standard Test Method for Rubber Thread—Resistance to Dry Heat[1]

This standard is issued under the fixed designation D3854; 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 This test method covers the extent of deterioration of rubber threads by measuring the reduction in physical properties when a thread is maintained at a constant elongation under conditions more severe than those encountered in service. This test method is a comparative indication only; it may not be possible to correlate the results with the actual duration of life in service.

1.2 The values stated in SI units are to be regarded as the standard. The values 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:*[2]

D1349 Practice for Rubber—Standard Temperatures for Testing

D2433 Test Methods for Rubber Thread (Withdrawn 2012)[3]

E145 Specification for Gravity-Convection and Forced-Ventilation Ovens

3. Summary of Test Method

3.1 The initial physical properties of the thread are determined by the appropriate test method in accordance with Test Methods D2433. The same test pieces, maintained at 100 % elongation, are subjected to aging in a circulating air oven. The residual physical properties are then measured and the percentage change reported.

3.2 The physical property measured in the test may be any of those described in Sections 18 to 37 of Test Methods D2433; however, the most suitable are the Schwartz value (Section 23) or stress retention (Section 33).

4. Significance and Use

4.1 Conventional rubber aging tests that are normally carried out on unstretched test specimens are of limited use in assessing the life of rubber threads since these are usually kept extended in use.

5. Apparatus

5.1 Suitable test apparatus for the measurement of the selected physical property is described in Sections 19, 30, and 35 of Test Methods D2433.

5.2 *Masonite Forms or Other Suitable Holder,* to maintain the test specimens at 100 % elongation.

5.3 *Circulating Hot-Air Oven,* as described in Specification E145, capable of maintaining temperatures of 100 ± 1 °C (212 ± 1.8 °F) and 150 ± 2 °C (302 ± 3.6 °F).

6. Procedure

6.1 Determine the initial selected physical property by the procedure given in the appropriate section of Test Methods D2433, using the recommended number of test specimens.

NOTE 1—If the Schwartz value is used, it is advisable to restrict the maximum massaging extension to 300 % to avoid excessive test specimen breakage during massaging after aging.

NOTE 2—If the stress retention at 100 % elongation is used, massage the thread to 300 % extension for six cycles before extending to 100 % for the stress to be measured.

6.2 Transfer the test specimen, maintained at 100 % extension, to the Masonite form or other suitable holder.

6.3 Allow the test specimen to rest on the form for 60 ± 10 min in a relaxed state, in the dark, in the standard atmospheres described in Section 3 of Practice D1349 for not less than 16 h before the test.

6.4 Place the test specimen in the circulating air oven for the period and temperature stated in the following table. Stabilize the oven temperature at the desired value before placing the forms in the oven; the heat capacity must be sufficient to ensure that the temperature is not lowered significantly when the forms are put in.

[1] This test method is under the jurisdiction of ASTM Committee D11 on Rubber and is the direct responsibility of Subcommittee D11.37 on Coated Fabrics, Rubber Threads and Seals.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

Class of Test	Temperature, °C (°F)	Time, h
A (normal)	100 ± 1 (212 ± 1.8)	22
B (heat resisting)[A]	150 ± 2 (302 ± 3.6)	2

[A] Test B is more severe and is intended for use with threads classified as "heat resistant."

6.5 After removal from the oven, maintain the test specimen under the conditions specified in 6.3 for a minimum of 16 h.

6.6 Redetermine the selected property by the method used for the initial value in 6.1.

7. Calculation

7.1 Express the performance of the thread as the percentage retention of the initial value of the selected physical property as follows:

$$SR_H = \frac{Pa}{Po} \times 100\,\% \quad (1)$$

where:

SR_H = percentage of initial value of any property retained by the test specimen after dry oven heat treatment,
Po = initial value of the selected physical property, and
Pa = value of that property after the aging period.

8. Report

8.1 Report the following information:

8.1.1 Full description of the sample and its origin,

8.1.2 Physical property selected, the test method and apparatus used,

8.1.3 Time and temperature of aging, and

8.1.4 Percentage retention of the physical property and the initial value.

9. Precision

9.1 The precision of this test method for measuring resistance to dry heat is as specified in Test Methods D2433.

10. Keywords

10.1 dry heat resistance; rubber thread