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# Standard Practice for Elevated Temperature Aging Using a Tubular Oven[1]

This standard is issued under the fixed designation D 1870; 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. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.*

## 1. Scope

1.1 This practice[2] covers a procedure for estimating the relative resistance of polymeric compounds to elevated temperature aging under controlled conditions of air circulation and freedom from contamination.

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 the safety problems 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 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[3]

D 883 Definition of Terms Relating to Plastics[3]

D 1600 Terminology Relating to Abbreviations, Acronyms, and Codes for Terms Relating to Plastics[3]

E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens[4]

## 3. Terminology

3.1 *General*—Definitions are in accordance with Definitions D 883 and abbreviations are in accordance with Terminology D 1600, unless otherwise indicated.

## 4. Summary of Practice

4.1 This practice consists of subjecting test specimens having previously determined properties to controlled deteriorating influences for known periods, after which the physical properties are again measured and the changes noted. In this practice, the test involves exposure of specimens to a carefully controlled flow of air at an elevated temperature and at atmospheric pressure.

## 5. Significance and Use

5.1 Any correlation between this practice and natural life of these materials must be determined for the particular application in which the materials are to be used.

## 6. Apparatus

6.1 *Forced Circulating-Air Oven*, provided with tubes and a means for calibrating and controlling air velocity within the tubes. The air velocity variation shall not exceed 10 % of the specified velocity. The temperature within the testing chamber shall be uniform within the tolerances given in Table 1 of Specification E 145 for Type II, Grade A ovens. The heating medium for the aging chamber shall be preheated air, circulated within it at atmospheric pressure. The heated air in both the chamber and in the tubes shall be thoroughly circulated by means of mechanical agitation. The design of the oven shall be such that heated fresh air enters one end of the tube and is exhausted from the system without being recirculated, eliminating the use of contaminated air and cross migration of volatile constituents contained in the specimens being tested. An apparatus meeting these requirements is described in Appendix X1.

6.2 *Recording Temperature-Indicating Device*, to measure the temperature near the center of the chamber.

6.3 *Velometer*,[5] or checking the air velocity.

6.4 *Specimen Holders*—Suitable specimen holders shall be provided, which will position the specimens within the tubes, separated from each other and the tube walls, and permit free flow of air around the specimens.

## 7. Sampling

7.1 Sampling shall be in accordance with the ASTM test methods for the specific properties to be determined.

## 8. Preparation and Calibration of Apparatus

8.1 Adjust the air within the tubes to the required test temperature within the range of 50 to 150°C.

8.2 Adjust the air flow in each tube to the required velocity.

NOTE—Velocities of 100 to 250 m/min have been used.

## 9. Conditioning

9.1 *Conditioning*—Condition the test specimens at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity for not

[1] This practice is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.50 on Permanence Properties.

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[2] For further information on this practice the following reference may be consulted: Markus Royen, "A Study of the Accelerated Aging of Vinyl Plastic Compounds in a Modified Testing Oven," ASTM Bulletin. No. 243, Jan., 1961, p. 43 (TP 1).

[3] *Annual Book of ASTM Standards*, Vol 08.01.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] Alnor Velometer Type 3002 has been found satisfactory for this purpose.