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Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging¹

This standard is issued under the fixed designation D 2126; 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 procedures for the thermal and humid exposure of rigid cellular plastics. Conditions used shall be agreed upon between the purchaser and the supplier.

NOTE 1—A list of commonly used exposure conditions can be found in Table 1.

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

NOTE 2—~~This test method resembles ISO 2796 in title only. The content is significantly different. This test method is equivalent to ISO 2796 in the sampling and calculation sections. It is not equivalent to ISO 2796 in the procedure section.~~ 2—This test method is equivalent to ISO 2796 in the sampling and calculation sections. It is not equivalent to ISO 2796 in the procedure section.

2. Referenced Documents

2.1 *ASTM Standards:*²

D 883 [Terminology Relating to Plastics](#)

D 1037 [Test Methods for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials](#)

2.2 *ISO Standard:*

ISO 2796 Cellular Plastics Rigid—Test for Dimensional Stability³

3. Terminology

3.1 The terms given in Terminology D 883 are applicable to this test method.

4. Significance and Use

4.1 Because of the wide variety of potential uses of rigid cellular plastics, artificial exposure to estimate the effective behavior of these materials must be based, to a great extent, on the intended application. Toward this end, this test method is intended to recommend a variety of conditions from which one or more of the desired exposure conditions can be selected. (Note 3)

4.2 The conditions recommended in this test method have been widely used in artificially exposing rigid cellular plastics and in determining the effects of various temperatures and humidities on these materials. Final test measurements are determined after the specimens return to room temperature. Where specified, the specimens will be tested at the exposure condition, but must be reported as such.

4.3 Dimensional changes measured by this test method can be used to compare the performance of materials in a particular environment, to assess the relative stability of two or more cellular plastics, or to specify an acceptance criterion for a particular material. The results of this test method are not suitable for predicting end-use product performance or characteristics, nor are they adequate for engineering or design calculations.

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.22 on Cellular Materials—Plastics and Elastomers.

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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 Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

*A Summary of Changes section appears at the end of this standard.

TABLE 1 Temperature and Relative Humidity Conditions

Temperature, °C-[°F]	Relative Humidity, %
-73 ± 3 [-100 ± 6]	ambient
-73 ± 3 (-100 ± 6)	ambient
-40 ± 3 [-40 ± 6]	ambient
-40 ± 3 (-40 ± 6)	ambient
70 ± 2 [158 ± 4]	ambient
70 ± 2 (158 ± 4)	ambient
100 ± 2 [212 ± 4]	ambient
100 ± 2 (212 ± 4)	ambient
150 ± 2 [302 ± 4]	ambient
150 ± 2 (302 ± 4)	ambient
23 ± 2 [73 ± 4]	50 ± 5
23 ± 2 (73 ± 4)	50 ± 5
38 ± 2 [100.0 ± 4]	97 ± 3
38 ± 2 (100.0 ± 4)	97 ± 3
70 ± 2 [158 ± 4]	97 ± 3
70 ± 2 (158 ± 4)	97 ± 3
other temperatures and humidities selected for individual needs	

NOTE 3—Where thermal shock is known or suspected to occur due to rapid heating to (or cooling from) a particular temperature, guidance on the permissible heating or cooling rates, or both, shall be obtained from the manufacturer of the material concerned.

NOTE 4—The dimensional change of a specimen can vary depending upon the age of the sample or the length of time between specimen preparation and the beginning of the test, or both.

4.4 Before proceeding with this test method, reference shall be made to the specification of the material being tested. Any test specimen preparation, conditioning, dimensions, or testing parameters covered in the materials specification, or combination thereof, shall take precedence over those mentioned in this test method. If there are no specifications, then the default conditions apply.

5. Apparatus

5.1 *Balance*, capable of weighing, to 0.05 %, a test specimen having a mass of 100 g or less.

5.2 *Oven*, circulating-air, capable of holding the required temperature of exposure within $\pm 2^{\circ}\text{C}$ [4°F]-(4°F).

5.3 *Cold Box*, capable of maintaining the required temperature of exposure within $\pm 3^{\circ}\text{C}$ [5°F]-(5°F).

5.4 *Gage*, dial-type, with a minimum foot area of 6.5 cm^2 [1 in.^2]-(1 in.^2) (Note 5). A vernier caliper having graduations not larger than 0.1 mm [0.005 in.]-(0.005 in.) can also be used. Care shall be taken that the specimen is not crushed in any way, regardless of which instrument is used.

NOTE 5—A dial gage comparator for determining linear variations is illustrated in Test Methods D 1037.

5.5 *Humidity Oven*, suitable for maintaining $\pm 3\%$ humidity, and the required temperature within $\pm 2^{\circ}\text{C}$ [4°F]-(4°F).

6. Sampling, Test Specimens, and Test Units

6.1 Test specimens shall be machined or sawed from the sample so as to have smooth edges free of cracks. All faces of the specimen shall be smooth. Finishing with No. 0 or finer sandpaper is permitted. Dust shall be blown off the specimens.

6.2 Test specimens shall have minimum dimensions of 100 by 100 mm by thickness supplied [4 by 4 in. by thickness supplied). Materials with and intended for use with natural or laminated skin surfaces shall be tested with skins intact.

6.3 A minimum of two specimens, but preferably three or more specimens, shall be used for each exposure condition.

6.4 Where destructive tests are to be made, several sets of specimens shall be used at the specified conditions.

7. Conditioning

7.1 Unless otherwise specified, by the contract or relevant material specification, condition specimens at least to a constant mass at $23 \pm 2^{\circ}\text{C}$ [73.4 ($73.4 \pm 4^{\circ}\text{F}$)] [4°F] and $50 \pm 5\%$ 10 % relative humidity before exposure.

8. Procedure

8.1 Make the following measurements after conditioning.

8.1.1 *Mass*—Determine mass, when specified, within 0.05 %.

8.1.2 *Dimensions*—Determine the dimensions of the three principal axes to the nearest $\pm 0.1\%$. For standard-size specimens, make one measurement per dimension at the approximate center of each face. If larger specimens are used, make three measurements of length and width, and five measurements of thickness. If specimens distort, report them as distorting under the specified aging conditions.

8.2 Expose the test specimens conditioned in accordance with 7.1 in a circulating air oven, humidity oven, or cold box maintained at one of the combinations of temperature and relative humidity shown in Table 1. Care shall be taken such that substantially free air circulation around the test specimens occur.