



Designation: D 618 – 05

Standard Practice for Conditioning Plastics for Testing¹

This standard is issued under the fixed designation D 618; 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 In general, the physical and electrical properties of plastics are influenced by temperature and relative humidity in a manner that materially affects test results. In order that reliable comparisons may be made of different materials and between different laboratories, it is necessary to standardize the humidity conditions, as well as the temperature, to which specimens of these materials are subjected prior to and during testing. This practice defines procedures for conditioning plastics (although not necessarily to equilibrium) prior to testing, and the conditions under which they shall be tested.

1.2 For some materials, there may be a material specification that requires the use of this practice, but with some procedural modifications. The material specification takes precedence over this practice. Refer to the material specification before using this practice. Table 1 in Classification D 4000 lists the ASTM material specifications that currently exist.

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 1—ISO 291 is related to this practice; however, ISO 291 describes only two temperature and humidity conditions for conditioning or testing, or both.

2. Referenced Documents

2.1 ASTM Standards:²

- D 709 Specification for Laminated Thermosetting Materials
- D 756 Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions
- D 4000 Classification System for Specifying Plastic Materials
- D 5032 Practice for Maintaining Constant Relative Humidity by Means of Aqueous Glycerin Solutions

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

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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.

E 104 Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions

2.2 ISO Standard:

ISO 291 Plastics—Standard Atmospheres for Conditioning and Testing³

3. Terminology

3.1 Definitions:

3.1.1 *room temperature*—a temperature in the range from 20 to 30°C [68 to 85°F].

3.1.2 *standard laboratory atmosphere*—an atmosphere having a temperature of 23°C [73.4°F] and a relative humidity of 50 % with standard tolerances as specified in 3.2 shall be the standard laboratory atmosphere.

3.1.3 *standard laboratory temperature*—a temperature of 23°C [73.4°F] with standard tolerance as specified in 3.2 shall be the standard laboratory temperature.

3.2 Tolerances:

3.3 *relative humidity*—standard tolerance shall be ± 5 %.

3.3.1 *Discussion*—Where the closer tolerance ± 2 % is required, it may be specified and the tolerance used reported.

3.4 *standard test temperatures other than standard laboratory temperature*—when data are to be obtained for comparison purposes at a specific temperature either above or below the standard laboratory temperature, the temperature should be selected from the following:

Test Temperatures, °C [°F]	Tolerance, plus or minus, °C [°F]
-70 [-94]	2.0 [3.6]
-55 [-67]	2.0 [3.6]
-40 [-40]	2.0 [3.6]
-25 [-13]	2.0 [3.6]
0 [32]	2.0 [3.6]
35 [95]	1.0 [1.8]
50 [122]	2.0 [3.6]
70 [158]	2.0 [3.6]
90 [194]	2.0 [3.6]
105 [221]	2.0 [3.6]
120 [248]	2.0 [3.6]
130 [266]	2.0 [3.6]
155 [311]	2.0 [3.6]
180 [356]	2.0 [3.6]
200 [392]	3.0 [5.4]
225 [437]	3.0 [5.4]

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

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

Test Temperatures, °C [°F]	Tolerance, plus or minus, °C [°F]
250 [482]	3.0 [5.4]
275 [527]	3.0 [5.4]
300 [572]	3.0 [5.4]
325 [617]	4.0 [7.2]
350 [662]	5.0 [9.0]
400 [752]	6.0 [10.8]
450 [842]	8.0 [14.4]
500 [932]	10.0 [18.0]
600 [1112]	12.0 [21.6]

3.5 *temperature*—standard tolerance shall be $\pm 2^{\circ}\text{C}$ [$\pm 3.6^{\circ}\text{F}$].

3.5.1 *Discussion*—Where the closer tolerance $\pm 1^{\circ}\text{C}$ [$\pm 1.8^{\circ}\text{F}$] is required, it may be specified and the tolerance used reported.

3.6 *temperature and relative humidity measurement*—measurements shall be made as close as possible to the center of the room or chamber.

3.6.1 *Discussion*—The temperature and relative humidity indicated at the control point, or on a recorder, may not be representative of a condition elsewhere in an enclosure or room because of local effects or deficiency in circulation of air. Additional measurements shall be made throughout the area to show compliance to the temperature and relative humidity required.

4. Significance and Use

4.1 Conditioning of specimens may be undertaken: (1) for the purpose of bringing the material into equilibrium with normal or average room conditions, (2) simply to obtain reproducible results, regardless of previous history of exposure, or (3) to subject the material to abnormal conditions of temperature or humidity in order to predict its service behavior.

4.2 The conditioning procedures prescribed in this practice are designed to obtain reproducible results and may give physical values somewhat higher or somewhat lower than values under equilibrium at normal conditions, depending upon the particular material and test. To ensure substantial equilibrium under normal conditions of humidity and temperature, however, may require from 20 to 100 days or more depending upon thickness and type of material and its previous history. Consequently, conditioning for reproducibility must of necessity be used for general purchase specifications and product control tests.

5. Sampling

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

6. Test Specimens

6.1 The numbers and types of test specimens shall be in accordance with the ASTM test methods for the specific properties to be determined.

7. Designations for Conditioning

7.1 *Designation for Conditioning Prior to Test:*

7.1.1 Conditioning of test specimens may be designated as follows:

7.1.1.1 A number indicating in hours the duration of the conditioning,

7.1.1.2 A number indicating in degrees Celsius the conditioning temperature, or

7.1.1.3 A number indicating relative humidity, whenever relative humidity is controlled, or a word to indicate immersion in a liquid.

7.1.2 The numbers shall be separated from each other by slant marks. A sequence of conditions shall be denoted by use of a plus (+) sign between successive conditions. “Des” shall be used to indicate desiccation over anhydrous calcium chloride. Temperature and relative humidity tolerances shall be in accordance with Section 3, unless otherwise specified.

NOTE 2—*Examples:*

Condition 96/23/50—Condition 96 h at 23°C and 50 % relative humidity.

Condition 48/50/water—Condition 48 h at 50°C in water.

Condition 48/50 + 96/23/50—Condition 48 h at 50°C; then condition 96 h at 23°C and 50 % relative humidity.

Condition 48/50 + Des—Condition 48 h at 50°C followed by desiccation.

7.2 *Designation for Test Condition:*

7.2.1 Test condition may be designated as follows:

7.2.1.1 A capital letter “T” following the prior conditioning designation and separated therefrom by a colon.

7.2.1.2 A number indicating in degrees Celsius the test temperature;

7.2.1.3 A number indicating the relative humidity in the test whenever relative humidity is controlled.

7.2.2 The numbers shall be separated from each other by a slant mark, and from the “T” by a dash. Temperature and relative humidity tolerances shall be in accordance with Section 3, unless otherwise specified.

NOTE 3—*Examples:*

Condition 24/180: T—180—Condition 24 h at 180°C: Test at 180°C.

Condition 96/35/90: T—35—90—Condition 96 h at 35°C and 90 % relative humidity: Test at 35°C and 90 % relative humidity.

8. Standard Procedures for Conditioning Prior to Test

8.1 *Procedure A*—Condition 40/23/50 for specimens 7 mm [0.25 in.] or under in thickness, 88/23/50 for specimens over 7 mm—Condition test specimens 7 mm or under in thickness in the standard laboratory atmosphere for a minimum of 40 h immediately prior to testing. Treat test specimens over 7 mm in thickness as above, except that the minimum time shall be 88 h. Provide adequate air circulation on all sides of the test specimens by placing them in suitable racks, hanging them from metal clips or laying them on wide-mesh, wire screen frames with at least 25 mm [1 in.] between the screen and the surface of the bench.

NOTE 4—*Procedure A* is generally satisfactory and is recommended unless other methods are specified. Note that *Procedure A* of Practice D 618 differs from Condition A of Specification D 709 and of the Military Specifications MIL-P designation in that Condition A means “as received, no special conditioning.”

NOTE 5—If for any particular material or test, a specific longer time of conditioning is required, the time shall be agreed upon by the interested parties. Shorter conditioning times may be used for thin specimens provided equilibrium is substantially obtained.

8.2 *Procedure B*—Condition 48/50 + Des—Condition the specimens for a period of 48 h in a circulating-air oven at a temperature of $50 \pm 2^{\circ}\text{C}$ [$122 \pm 3.6^{\circ}\text{F}$]. Remove the specimens from the oven and cool to the room temperature in a