Designation: D1204 – 14

Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature[1]

This standard is issued under the fixed designation D1204; 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 U.S. Department of Defense.

1. Scope*

1.1 This test method covers the measurement of changes in linear dimensions of nonrigid thermoplastic sheeting or film that result from exposure of the material to specified conditions of elevated temperature and time.

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.*

NOTE 1—This test method and ISO 11501 address the same matter, but differ in technical content (and results cannot be directly compared between the two methods).

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D618 Practice for Conditioning Plastics for Testing

D883 Terminology Relating to Plastics

D2732 Test Method for Unrestrained Linear Thermal Shrinkage of Plastic Film and Sheeting

D4000 Classification System for Specifying Plastic Materials

2.2 *ISO Standard*

ISO 11501 Plastics: Film and Sheeting—Determination of Dimensional Change on Heating[3]

3. Terminology

3.1 *Definitions*—Terms applicable to this test method are defined in Terminology D883.

4. Significance and Use

4.1 This test method is particularly applicable to nonrigid thermoplastic sheeting or film made by the calender or extrusion process. The test gives an indication of lot-to-lot uniformity in regards to the degree of internal strains introduced during processing.

4.2 The heating medium in this test method is air and does not necessarily yield the same results as Test Method D2732, which uses a liquid medium.

4.3 Before proceeding with this test method, review the specifications of the material being tested, if available. Any test specimen preparation, conditioning, dimensions, or testing parameters, or combination thereof, covered in the relevant ASTM material specification shall take precedence over those mentioned in this test method. If there are no relevant ASTM material specifications, then the default conditions apply. Table 1 of Classification System D4000 lists the ASTM material standards that currently exist.

5. Apparatus

5.1 *Oven*—A mechanical convection oven capable of maintaining a temperature of 100 ± 1°C.

5.2 *Scale,* graduated in 0.25-mm (0.01-in.) divisions, 30 cm (12 in.) or more in length.

5.3 *Thermometer,* graduated in 1°C divisions, with a range suitable for the test temperature used.

5.4 *Timer,* graduated in minutes.

5.5 *Template,* 25 by 25 cm (10 by 10 in.), for cutting test specimens.

5.6 *Heavy Paper Sheets,* approximately 40 by 40 cm (15 by 15 in.), with smooth, wrinkle- and crease-free surfaces.

5.7 *Talc,* finely ground.

[1] This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.19 on Film, Sheeting, and Molded Products.

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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**

6. Test Specimens

6.1 The test specimens shall be two pieces of the sheeting or film 25 by 25 cm (10 by 10 in.), cut with the aid of the template, one from either of the two transverse edges and one from the center of the sheet as shown in Fig. 1. Each specimen shall be marked to show the direction of calendering or extrusion. The midpoint of each edge shall be marked for use as a reference point when final measurements are made.

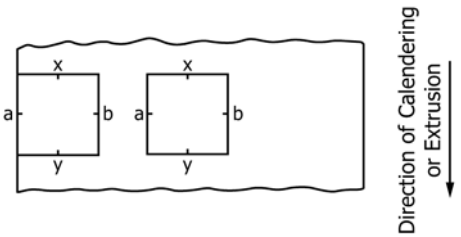
7. Conditioning

7.1 *Conditioning*—Condition the test specimens at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 10 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D618 unless otherwise specified by agreement or the relevant ASTM material specification. In cases of disagreement, the tolerances shall be ±1°C (±1.8°F) and ±5 % relative humidity.

8. Procedure

8.1 Place each specimen on the heavy paper that has been lightly dusted with talc, and cover with a second piece of dusted paper. Fasten the papers together with paper clips.

NOTE 2—The paper should be well dusted, and the specimens should not be restricted either by the paper or the clips. *It is imperative that the specimens be free to change shape as strains are relieved during the period of test.*



Points *a*, *b* and *x*, *y* are reference marks at midpoint of test specimen edges.

FIG. 1 Method of Cutting Test Specimens from Sample

8.2 Place the paper-plastic sandwiches horizontally in the oven at the temperature and for the length of time applicable to the material being tested. Sandwiches must not be stacked, as this has the potential to restrict the movement of the plastic between the papers.

8.3 At the end of the oven-exposure period, recondition the specimens for a minimum of 1 h at the temperature and humidity used for the initial conditioning. Remove the papers and measure the distance between the opposite edges of the specimens at the reference marks to the nearest 0.25 mm (0.01 in.). Shorter reconditioning times are permissible, if it can be shown that equivalent results are obtained.

9. Calculations

9.1 Calculate the linear dimensional change as follows:

$$\text{Linear change, \%} = [(D_f - D_o)/D_o] \times 100 \quad (1)$$

where:

D_f = final length (or width) of specimen, mm (or in.) after test, and

D_o = original length (or width) of specimen, mm (or in.).

A negative value denotes shrinkage, and a positive value indicates expansion.

9.2 Average the values obtained for each direction.

10. Report

10.1 Report the following information:

10.1.1 Identification of the material tested,

10.1.2 Test conditions (time and temperature), including conditioning of test specimens, and

10.1.3 Average percentage linear change in both the parallel and the transverse direction of processing.

11. Precision and Bias

11.1 A task group will be formed to develop the precision and bias statement for this test method.

12. Keywords

12.1 film; sheeting; temperature; thermoplastic

SUMMARY OF CHANGES

Committee D20 has identified the location of selected changes to this standard since the last issue (D1204 - 08) that may impact the use of this standard. (March 1, 2014)

(1) Removed the permissive word “may” in 4.2, 8.2, and 8.3.

(2) Removed the permissive word “should” in 4.3.