Designation: D 1204 – 94ε1

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 D 1204; 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.

ε[1] NOTE—Editorially changed Footnote 1 to reflect jurisdiction change in April 2002.

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—ISO/DIS 11501 describes a similar procedure for determining linear dimensional changes of thermoplastic polymers subjected to elevated temperatures.

2. Referenced Documents

2.1 *ASTM Standards:*

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[2]

D 2732 Test Method for Unrestrained Linear Thermal Shrinkage of Plastic Film and Sheeting[3]

2.2 *ISO Standard*

ISO/DIS 11501, Plastics: Film and Sheeting—Determination of Dimensional Change on Heating[4]

3. Significance and Use

3.1 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 as regards to the degree of internal strains introduced during processing.

3.2 The heating medium in this test method is air and may not yield the same results as Test Method D 2732, which uses a liquid medium.

4. Apparatus

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

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

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

4.4 *Timer*, graduated in minutes.

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

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

4.7 *Talc*, finely ground.

5. Test Specimens

5.1 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.

6. Conditioning

6.1 *Conditioning*—Condition the test specimens at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D 618, for those tests where conditioning is required. In cases of disagreement, the tolerances shall be± 1°C (±1.8°F) and ±2 % relative humidity.

6.2 *Test Conditions*—Conduct tests in the standard laboratory atmosphere of 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity, unless otherwise specified in the test methods or in this test method. In cases of disagreements, the tolerances shall be ±1°C (±1.8°F) and ±2 % relative humidity.

[1] This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.19 on Film and Sheeting.

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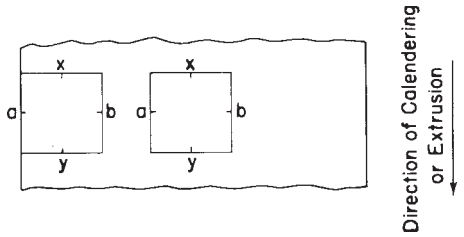
[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 08.02.

[4] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.



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

FIG. 1 Method of Cutting Test Specimens from Sample

7. Procedure

7.1 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.*

7.2 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 may restrict movement of the plastic between the papers.

7.3 At the end of the oven-exposure period, recondition the specimens a minimum of 1 h at 23°C and 50 % relative humidity. 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 may be used if it can be shown that equivalent results are obtained.

8. Calculations

8.1 Calculate the linear dimensional change as follows:

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

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.

8.2 Average the values obtained for each direction.

9. Report

9.1 Report the following information:

9.1.1 Identification of the material tested,

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

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

10. Precision and Bias

10.1 A task group has been formed to develop the precision and bias statement for this test method.

11. Keywords

11.1 film; sheeting; temperature; thermoplastic