



Standard Test Method for Resistance of Types III and IV Polyethylene Plastics to Thermal Stress-Cracking¹

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1. Scope *

1.1 This test method covers determination of the susceptibility of Types III and IV polyethylene plastics (as defined in the table on Classification of Polyethylene Plastics Molding and Extrusion Materials According to Type, in Specification D 1248) to thermal stress-cracking.

NOTE 1—It has also been found useful in testing specimens from fabricated items such as pipe or conduit.

1.2 The values stated in SI units are to be regarded as the standard, except in cases where materials, products, or equipment are available only in inch-pound units. The values in parentheses are given 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.* Specific precautionary statements are given in Note 7.

NOTE 2—There is no similar or equivalent ISO standard.

2. Referenced Documents

2.1 ASTM Standards:

- A 276 Specification for Stainless Steel Bars and Shapes²
- D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing³
- D 883 Terminology Relating to Plastics³
- D 1248 Specification for Polyethylene Plastics Molding and Extrusion Materials³
- D 4703 Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets⁴
- E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens⁵

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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² Annual Book of ASTM Standards, Vol 01.03.

³ Annual Book of ASTM Standards, Vol 08.01.

⁴ Annual Book of ASTM Standards, Vol 08.03.

⁵ Annual Book of ASTM Standards, Vol 14.04.

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms see Terminology D 883.

4. Summary of Test Method

4.1 Strips of material 127 by 6.4 by 1.3 mm (5.0 by 0.25 by 0.050 in.) are cut from a molded test sheet. The strips are helically wrapped and fastened to a 6.4-mm (0.25-in.) diameter metal rod. The assembly is then placed in the specified test environment. The specimens are examined at the end of specified time intervals and the cumulative number of those which have failed is recorded for each time interval.

5. Significance and Use

5.1 Resistance to thermal stress-cracking is a property that is of importance in material used for jacketing and insulation of wire and cable.

5.2 As a general correlation between test results and field performance has been recognized, this test may be considered suitable for specification acceptance.^{6, 7}

5.3 Some polyethylenes embrittle or crack if they are exposed to elevated temperatures. This embrittlement may result in severe cracking, especially if the polymers are stressed during exposure. The phenomena causing thermal-stress cracking are not clearly understood. It is evident that either increasing the density or decreasing the molecular weight has a detrimental effect on the resistance to thermal-stress cracking.

5.4 This is a pass or fail test, not intended for arranging various Type III and IV polyethylene plastics in a series.

6. Apparatus

6.1 *Blanking Die*, with a rectangular opening, 127 by 6.4 mm (5.0 by 0.25 in.). The cutting edges shall be sharp and free of nicks so that clean cuts are made.⁸

6.2 *Leather Punch, Drill or Equivalent*, capable of producing clean holes approximately 1.6 mm (1/16 in.) in diameter.

⁶ Heiss, J. H., and Lanza, V. L., *Wire and Wire Products*, Vol 33, pp 1182–87 (1958).

⁷ Heiss, J. H., Lanza, V. L., and Martin, W. M., *Wire and Wire Products*, pp 592–593, pp 626–627, May 1959. ASTM Round Robin, RR:D20–1000.

⁸ Round-robin data for this test method may be obtained from ASTM Headquarters. Request RR:D20-1008.

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