



Designation: D 2103 – 03

Standard Specification for Polyethylene Film and Sheeting¹

This standard is issued under the fixed designation D 2103; 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 approval. 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 specification covers the classification of polyethylene film and sheeting up to 0.3 mm [0.012 in.] in thickness, inclusive. The film or sheeting may contain additives for the improvement of the surface properties, pigments, or stabilizers, or combinations thereof.

1.2 The values stated in SI units are to be regarded as standard. The values given in brackets are for information only.

1.3 The following precautionary caveat pertains only to the test method portion, Section 8, of this specification: *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.*

1.4 This specification allows for the use of recycled polyethylene film or resin as feedstock, in whole or in part, as long as all the requirements as governed by the producer and end user are also met (see Note 1).

NOTE 1—Guide D 5033 describes terminology and definitions related to recycled plastics.

NOTE 2—There is no known ISO equivalent to this specification.

2. Referenced Documents

2.1 ASTM Standards:

- D 374 Test Methods for Thickness of Solid Electrical Insulation²
- D 618 Practice for Conditioning Plastics for Testing³
- D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting³
- D 883 Terminology Relating to Plastics³
- D 1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics³
- D 1434 Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting⁴

- D 1505 Test Method for Density of Plastics by the Density-Gradient Technique³
- D 1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method³
- D 1746 Test Method for Transparency of Plastic Sheeting³
- D 1893 Test Method for Blocking of Plastic Film⁵
- D 1894 Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting³
- D 1898 Practice for Sampling of Plastics⁶
- D 1922 Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method³
- D 1938 Test Method for Tear-Propagation Resistance (Trouser Tear) of Plastic Film and Thin Sheeting by a Single-Tear Method³
- D 2457 Test Method for Specular Gloss of Plastic Films and Solid Plastics⁷
- D 2578 Test Method for Wetting Tension of Polyethylene and Polypropylene Films⁷
- D 2839 Practice for the Use of a Melt Index Strand for Determining Density of Polyethylene⁸
- D 3892 Practice for Packaging/Packing of Plastics⁷
- D 4321 Test Method for Package Yield of Plastic Film⁷
- D 4703 Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets⁹
- D 4976 Specification for Polyethylene Plastics Molding and Extrusion Materials⁸
- D 5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics⁸
- E 96 Test Methods for Water Vapor Transmission of Materials¹⁰
- F 1249 Test Method for Water Vapor Transmission Rate through Plastic Film and Sheeting Using a Modulated Infrared Sensor¹¹

3. Terminology

3.1 Definitions:

¹ This guide is under the jurisdiction of ASTM Committee D20 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 10.01.

³ Annual Book of ASTM Standards, Vol 08.01.

⁴ Annual Book of ASTM Standards, Vol 09.01.

⁵ Discontinued; see 1990 Annual Book of ASTM Standards, Vol 08.01.

⁶ Discontinued; see 1997 Annual Book of ASTM Standards, Vol 08.01.

⁷ Annual Book of ASTM Standards, Vol 08.02.

⁸ Annual Book of ASTM Standards, Vol 10.02.

⁹ Annual Book of ASTM Standards, Vol 08.03.

¹⁰ Annual Book of ASTM Standards, Vol 04.06.

¹¹ Annual Book of ASTM Standards, Vol 15.09.

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

3.1.1 Unless otherwise specified, the definitions of plastics used in this specification are in accordance with Terminology D 883.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *treated*—surface characteristics of the sheet or film have been modified by flame, corona discharge, or other means to promote the adhesion of inks, etc.

3.2.2 *yield*—the area provided by a given weight of film or sheeting of specified thickness.

4. Classification

4.1 The film and sheeting covered in this specification shall be designated by a type number, composed by listing the desired cell limit for each of the five properties, in the order shown in Table 1.

NOTE 3—Examples of this classification system are as follows:

(1) A high-clarity packaging film might be described as follows:
 Type Number 2 1 1 1 2
 Density (0.926 to 0.940) _____
 Impact strength (<40) _____
 Coefficient of friction (<0.20) _____
 Haze (<5.0) _____
 Nominal Thickness 0.0254–<0.0508 mm (0.0010–<0.0020 in.)

(2) A thin garment bag film might be described as follows:
 Type Number 2 1 1 2 2
 Density (0.926 to 0.940) _____
 Impact strength (<40) _____
 Coefficient of friction (<0.20) _____
 Haze (5.0 to 9.0) _____
 Nominal Thickness 0.0254–<0.0508 mm (0.0010–<0.0020 in.)

(3) A tough, thick, pigmented industrial film might be described as follows:
 Type Number 1 4 3 3 5
 Density (0.910 to 0.925) _____
 Impact strength (151–300) _____
 Coefficient of friction (0.41 to 0.70) _____
 Haze (>9.0) _____
 Nominal Thickness 0.1778–≤0.3048 mm (0.0070–≤0.0120 in.)

With this type of classification it is possible to assemble on paper a combination of properties that is impossible to obtain with the present state of technology. A purchaser using this specification for the first time will probably find it necessary to contact material suppliers to learn what materials are commercially available.

4.2 In cases where surface treatment is specified by the purchaser, the test method must be agreed upon between the

purchaser and the seller. The recommended test to measure the degree of surface treatment is Test Method D 2578.

5. General Requirements

5.1 *Appearance*—The material shall have appearance qualities conforming with those produced by good commercial practice. It shall be as free as commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw material. There shall be no other visible defects such as holes, tears, or blisters. The edges shall be free of nicks and cuts visible to the unaided eye. There shall be no visible evidence of damage from shipping.

5.2 *Thickness Tolerances*—The point-to-point thickness tolerances of the film or sheeting covered in this specification shall be nominal ±20 %.

5.3 *Yield Tolerances*—The actual yield of film or sheeting covered in this specification shall be within the tolerance limits of the nominal yield as prescribed in Table 2. In cases where each roll, blanket, or unit of production is packaged and marked by the producer as the ultimate consumer sales unit with stated dimensions, the single-roll tolerances for yield shall apply.

5.4 *Width Tolerances*—The tolerance for width shall be ±3.2 mm [0.13 in.]/ft of nominal width except that the tolerance shall be not less than ±3.2 mm [0.13 in.].

5.5 *Length*—For unit consumption the length of film or sheeting per roll shall be within +4, -0 % of the length as marked, or as agreed upon between the purchaser and the seller. Each roll shall be in one piece, except that it is permissible for no more than 20 % of the rolls in any one shipment to contain a maximum of three pieces. Such rolls shall be clearly labeled.

6. Detail Requirements

6.1 The film or sheeting shall conform to the requirements of Table 1 as indicated by the type designation.

6.2 The film and sheeting shall not be blocked excessively as agreed upon between the purchaser and the seller.

7. Sampling

7.1 Samples of film or sheeting sufficient to determine conformance to this specification shall be taken at random.

TABLE 1 Type Numbers

Property Order Number	Property	0	1	2	3	4	5	Units
1	Density ^A	unspecified	0.910–<0.926	0.926–<0.941	0.941–0.965	<0.910	...	g/cm ³
2	Impact strength ^B	unspecified	<40	40–70	71–150	151–300	>300	g
3	Coefficient of friction	unspecified	<0.20	0.20–0.40	0.41–0.70	>0.70
4	Haze	unspecified	<5.0	5.0–9.0	>9.0
5	Nominal thickness	unspecified	^C	^D	^E	^F	^G	mm [in.]

^A Annealed density of molded plaques or Melt Index extrudates.

^B F50 (Results of a recent round robin have shown the equivalency of these two procedures.)

^C <0.0254 [^C0.0010].

^D 0.0254–<0.0508 [0.0010–<0.0020]

^E 0.0508–<0.1016 [0.0020–<0.0040]

^F 0.1016–<0.1778 [0.0040–<0.0070]

^G 0.1778–≤0.3048 [0.0070–≤0.0120]