Designation: D 2103 – 97

Standard Specification for Polyethylene Film and Sheeting[1]

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 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 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 all three.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses 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 Insulation[2]

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[3]

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting[3]

D 1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics[3]

D 1434 Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting to Gases[4]

D 1505 Test Method for Density of Plastics by the Density-Gradient Technique[3]

D 1709 Test Methods for Impact Resistance of Polyethylene Film by the Free Falling Dart Method[3]

D 1746 Test Method for Transparency of Plastic Sheeting[3]

D 1893 Test Method for Blocking of Plastic Film[3]

D 1894 Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting[3]

D 1898 Practice for Sampling of Plastics[3]

D 1922 Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method[3]

D 1938 Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method[3]

D 2457 Test Method for Specular Gloss of Plastic Films[5]

D 2578 Test Method for Wetting Tension of Polyethylene and Polypropylene Films[5]

D 2839 Practice for the Use of a Melt Index Strand for Determining Density of Polyethylene[6]

D 3892 Practice for Packaging/Packing of Plastics[5]

D 4321 Test Method for Package Yield of Plastic Film[5]

D 4976 Specification for Polyethylene Plastics Molding and Extrusion Materials[6]

D 5033 Guide for the Development of Standards Relating to the Proper Use of Recycled Plastics[6]

E 96 Test Methods for Water Vapor Transmission of Materials in Sheet Form[7]

2.2 *NIST Standard:*

National Institute of Standards and Technology Circular 585 Measurement of Thickness[8]

2.3 *Military Standard:*

[1] This guide is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.94 on Government/Industry Standardization.

Current edition approved Nov. 10, 1996. Published January 1997. Originally published as D 1999 – 91. Last previous edition D 1999 – 96.

A title change was the subject of this revision.

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

[6] *Annual Book of ASTM Standards*, Vol 10.02.

[7] *Annual Book of ASTM Standards*, Vol 08.03.

[8] *Annual Book of ASTM Standards*, Vol 11.03.

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

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes[9]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *ethylene plastics*—plastics based on polymers made with ethylene as the sole monomer.

3.1.2 *polyethylene plastics*—plastics based on polymers of ethylene or copolymers of ethylene and other monomers, the ethylene being the greatest amount by mass.

3.1.3 *treated*—modification of the surface characteristics of the sheet or film by flame, corona discharge, or other means to promote the adhesion of inks, etc.

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	0
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	0
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	3	3	3	1
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 wishing to use this specification for the first time will probably find it necessary to contact material suppliers to learn what materials are commercially available. After establishing which available material meets his requirements, the purchaser may, from then on, specify the material by the appropriate type number.

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

[9] International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) standards are available from ANSI, 11 West 42nd St., 13th Floor, New York, NY 10036.

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 (<0.0010).
[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)