



Designation: D 4397 – 00

Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications¹

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1. Scope *

1.1 This specification covers polyethylene sheeting, 250 μm (0.010 in. or 10 mils) or less in thickness, intended for construction, industrial, and agricultural applications.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 The following precautionary statement pertains only to the test methods 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.*

NOTE 1—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 and Electrical Insulating Materials for Testing³
- D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting³
- D 883 Terminology Relating to Plastics³
- D 1505 Test Method for Density of Plastics by the Density-Gradient Technique³
- D 1709 Test Method for Impact Resistance of Polyethylene Film by the Free Falling Dart Method³
- D 1898 Practice for Sampling of Plastics³
- D 2103 Specification for Polyethylene Film and Sheeting³
- D 3892 Practice for Packaging/Packing of Plastics⁴
- E 96 Test Methods for Water Vapor Transmission of Materials⁵
- E 97 Test Method for Directional Reflectance Factor, 45-

deg 0-deg, of Opaque Specimens by Broad-Band Filter Reflectometry⁶

F 88 Test Methods for Seal Strength of Flexible Barrier Materials⁷

2.2 Military Standard:

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes⁸

3. Terminology

3.1 *Definitions*—The plastics terminology used in this specification is in accordance with the definitions given in Terminology D 883.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *nominal length*—the length of sheeting in any roll, as specified on product labels, invoices, sales literature, and the like.

3.2.2 *nominal net weight*—the weight of sheeting in any roll, as specified on product labels, invoices, sales literature, and the like.

3.2.3 *nominal thickness*—the thickness of sheeting in any roll, as specified on product labels, invoices, sales literature, and the like.

3.2.4 *nominal width*—the width of sheeting in any rolls, as specified on product labels, invoices, sales literature, and the like.

4. Materials

4.1 The sheeting shall be made from polyethylene or modified polyethylene, such as an ethylene copolymer consisting of a major portion of ethylene in combination with a minor portion of some other monomer, or a mixture of polyethylene with a lesser amount of other polymers.

NOTE 2—Polyethylene sheeting is made in a variety of colors, opacities, translucencies, and dimensions. It is recommended that manufacturers be consulted on the varieties available.

5. General Requirements

5.1 *Appearance*—The sheeting shall have appearance qualities conforming with those produced by good commercial

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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 08.02.

⁵ Annual Book of ASTM Standards, Vol 04.06.

⁶ Annual Book of ASTM Standards, Vol 06.01.

⁷ Annual Book of ASTM Standards, Vol 15.09.

⁸ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

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

practices. It shall be as free as is commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw material. There shall be no other visible defects such as blocking, holes, tears, or blisters. The edges shall be free of nicks and cuts visible to the unaided eye.

5.2 Dimensions:

5.2.1 Size—The nominal thickness, width, and length of the sheeting in each roll shall be agreed upon between the buyer and the seller.

5.2.2 Tolerances:

5.2.2.1 Thickness—The thickness at any point, when measured in accordance with 8.5, shall not be less than 80 % of the nominal thickness.

5.2.2.2 Width—The tolerance for widths of 0.3 m (1 ft) or more, shall be 3.2 mm (1/8 in.) per foot of nominal width. For all widths less than 0.3 m (1 ft), the tolerance shall be 3.2 mm (1/8 in.). Width to be measured in accordance with 8.6.

5.2.2.3 Length—The length of sheeting per roll, when measured in accordance with 8.6, shall be within + 3 % to – 1 % of the length specified.

5.2.3 Minimum Net Weight—The actual net weight of each roll shall be not less than the nominal net weight, when determined in accordance with the formula established in 8.7. The nominal net weight shall, in turn, be the labeled net weight.

6. Detail Requirements

6.1 Color and Finish—The sheeting may be natural, (essentially colorless), color tinted, translucent, or opaque. The surface finish may be plain, printed, or otherwise treated as agreed upon between the buyer and the seller.

6.2 Impact Resistance—The average impact resistance shall be not less than the resistance specified in Table 1, when tested in accordance with 8.8.

6.3 Mechanical Properties—The average tensile strength and elongation at break for all thicknesses of sheeting shall be as specified in Table 2, when tested in accordance with 8.9.

6.4 Reflectance—The average 45°, 0° directional reflectance of white opaque sheeting, intended for use in curing concrete, shall be not less than 70 %, when determined in accordance with 8.10.

6.5 Luminous Transmittance—Black sheeting intended for exclusion of light and for maximum resistance to weathering shall have an average luminous transmittance not greater than 1 %, when determined in accordance with 8.11. This low level of luminous transmittance indicates a high degree of opacity.

TABLE 1 Dart Drop Impact Resistance^A

Nominal Thickness, μm (mils)	Dart Drop Impact Resistance, min, g
25 (1.0)	40
38 (1.5)	65
50 (2.0)	85
75 (3.0)	125
100 (4.0)	165
125 (5.0)	205
150 (6.0)	260
175 (7.0)	315
200 (8.0)	370
225 (9.0)	420
250 (10.0)	475

^A Values for nominal thickness other than those listed shall be determined by arithmetical interpolation.

TABLE 2 Mechanical Properties

	Lengthwise Direction	Crosswise Direction
Tensile strength, min, MPa (psi)	11.7 (1700)	8.3 (1200)
Elongation, min, % ^A	225	350

^A For films of nominal thickness of <2 mils (<50 μm), minimum % to be 200 and 325, respectively (LD/CD).

6.6 Water Vapor Transmission Rate (WVTR)—The average water vapor transmission shall not be greater than 22.0 g/m^2 (1.40 $\text{g}/100 \text{ in.}^2$) per 24 h for sheeting 25 μm (1 mil) in thickness, when determined in accordance with 8.12. The water vapor transmission rate is inversely proportional to the thickness. Maximum limits for rate of water transmission as a function of thickness are given in Table 3. Equivalent maximum limits in terms of permeance are given in Table 4. It should be noted that the WVTR requirement is not necessary for all applications (such as pallet wrap). However, Table 3 and Table 4 may be used for those cases where the WVTR is an important consideration.

7. Sampling

7.1 Samples for test purposes shall be taken from rolls, selected at random from the total number of rolls in each shipment or lot, in accordance with Table 5.

7.2 The samples for testing shall be full width and shall be cut at least three full turns, but not less than 1.5 m (5 ft), from either end of the sheeting on each roll. Normally about 2 m^2 (20 ft^2) of sheeting is needed to carry out all the tests. All the tests shall be made on each sample roll. Rolls damaged in shipment shall not be selected for testing.

7.3 The specimens to be used for a particular test shall be cut from different parts of the sheeting sample (that is, they shall not be cut adjacent to one another), unless otherwise specified in the test.

8. Test Methods

8.1 General—The tests given herein are intended primarily for use as production tests in conjunction with manufacturing processes and inspection methods to insure conformity of sheeting with the requirements of this specification.

8.2 Production Inspection and Testing—During the process of manufacture, the manufacturer shall make inspections and tests in accordance with methods described by this specification. The manufacturer shall keep such essential records and

TABLE 3 Specification for Water Vapor Transmission Rate (WVTR)^A

WVTR ($\text{g}/24\text{-h}\cdot\text{m}^2$) max	Nominal Thickness		WVTR ($\text{g}/24\text{-h}\cdot100\text{-in.}^2$) max
	μm	(mils)	
22.0	25	(1)	1.40
11.0	50	(2)	0.70
7.3	75	(3)	0.47
5.5	100	(4)	0.35
4.4	125	(5)	0.28
3.7	150	(6)	0.23
3.1	175	(7)	0.20
2.8	200	(8)	0.18
2.4	225	(9)	0.16
2.2	250	(10)	0.14

^A Values for nominal thickness other than those listed shall be determined by arithmetical interpolation.