Designation: D 3595 – 02

Standard Specification for Polychlorotrifluoroethylene (PCTFE) Extruded Plastic Sheet and Film[1]

This standard is issued under the fixed designation D 3595; 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 extruded sheet and film in thicknesses from 0.015 to 0.25 mm (0.0006 to 0.01 in.).

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

1.3 The following precautionary statement pertains only to the test methods portion, Section 9 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 ISO equivalent specification to this specification.[2]

2. Referenced Documents

2.1 *ASTM Standards:*

D 374 Test Methods for Thickness of Solid Electrical Insulation[3]

D 618 Practice for Conditioning Plastics for Testing[4]

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting[4]

D 883 Terminology Relating to Plastics[4]

D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature[4]

D 1430 Classification System for Polychlorotrifluoroethylene (PCTFE) Plastics[4]

D 1600 Terminology for Abbreviated Terms Relating to Plastics[4]

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

F 1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor[6]

IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System [7]

3. Terminology

3.1 Definitions of terms used in this specification shall be in accordance with Terminology D 883.

3.2 *lot*, *n*—one production run or a uniform blend of two or more production runs.

3.3 Abbreviations are in accordance with Terminology D 1600. PCTFE is the abbreviation for polychlorotrifluoroethylene.

4. Classification

4.1 This specification covers four types of polychlorotrifluoroethylene sheet and film:[8]

4.1.1 *Type I*—Transparent film, with high and low moisture vapor transmission rate.

4.1.2 *Type II*—Dimensionally stable transparent sheet and film with low moisture vapor transmission rate.

4.1.3 *Type III*—Dimensionally stable transparent film with very low moisture vapor transmission rate.

4.1.4 *Type IV*—Low crystalline transparent film with high ductility and extremely low moisture vapor transmission.

4.2 A one-line system may be used to specify materials covered by this specification. The system uses predefined cells to refer to specific aspects of this specification, as illustrated below.

[1] This specification 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] As defined in IEEE/ASTM SI 10.

[3] *Annual Book of ASTM Standards*, Vol 10.01.

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

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

[6] *Annual Book of ASTM Standards,* Vol 15.09.

[7] Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428–2959.

[8] The basic polymer used to make these types of polymer does not correspond to the types given in Specification D 1430.

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

TABLE 1 Thickness Tolerance

Thickness		Tolerance, %	Type Availability
mm	in.		
0.015	0.0006	±20	IV
0.019	0.00075	±20	III
0.023	0.0009	±20	IV
0.038	0.0015	±20	I,
0.051	0.0002	±15	I, II, III, IV
0.076	0.0003	±15	II
0.127	0.0005	±15	II
0.19	0.0075	±10	II
0.20	0.0078	±10	III
0.25	0.010	±10	II

Specification				
Standard Number Block : :	Type : :	Grade : :	Class : :	Special Notes :
:	:	:	:	:
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Example: Specification D 3595 — 02,	I	6	C	

For this example, the line callout would be Specification D 3595 – 02, I6C, and would specify a coagulated dispersion form of polytetrafluoro-ethylene that has all of the properties listed for that Type, Grade, and Class in the appropriate specified properties, tables, or both, in the specification identified. A comma is used as the separator between the Standard Number and the Type. Separators are not needed between the Type, Grade, and Class.[9] Provision for Special Notes is included so that other information can be provided when required. An example would be in Specification D 3295 – 81a where dimensions and tolerances are specified for each AWG size within Type and Class. When Special Notes are used, they should be preceded by a comma.

5. Requirements

5.1 The sheet and film shall be manufactured from polychlorotrifluoroethylene (PCTFE) plastics that consist of at least 90 % chlorotrifluoroethylene. The remaining 10 % may include chemical modifications, such as co-monomers, but not colorants, fillers, plasticizers, or mechanical blends of other resins.

5.2 The length, width, roll core diameter, and maximum number of splices permitted shall be as agreed upon between the purchaser and the seller. The tolerance for roll width shall be 3 % mm (⅛ in.). The tolerance for roll length shall be ± 10 % of the specified length.

5.3 Thickness tolerances shall be as specified in Table 1.

5.4 The sheet and film shall conform to the property values specified in Table 2, Table 3, and Table 4.

5.5 The material shall be essentially free from contamination, wrinkles, holes, scratches, and other imperfections unless otherwise agreed upon between the purchaser and the seller.

6. Sampling

6.1 Sampling shall be statistically adequate to satisfy the requirements of 10.4.

[9] See the ASTM *Form and Style Manual*. Available from ASTM Headquarters.

TABLE 2 Tensile Strength and Elongation

Thickness, mm (in.)	Type	Tensile Strength, min		Elongation, min, %
		psi	MPa	
0.019 to 0.038 (0.00075 to 0.0015)	I, II, III	2800	19.32	50
0.051 to 0.25 (0.020 to 0.01)	I, II, III	3100	21.40	50
0.016 to 0.051 (0.0006 to 0.002)	IV	4500	31.0	70

TABLE 3 Dimensional Stability

Thickness, mm (in.)	Type	Shrinkage,[A] max,%
0.038 to 0.051 0.0015 to 0.002	I	±17
0.019 to 0.051 0.00075 to 0.002	II, III	±3
0.051 to 0.25	III	±3
0.002 to 0.25	II	±5
0.016 to 0.051 0.0006 to 0.002)	IV	±15

[A] Positive sign means increase in length.

TABLE 4 Moisture Vapor Transmission Rate

Thickness		Type	Moisture Vapor Transmission Rate, max, g/m^2 × 24 h
mm	in.		
0.038	0.0015	I	0.61
0.019	0.00075	III	0.68
0.051	0.002	II	0.57
0.0051	0.002	III	0.31
0.016	0.0006	IV	0.42
0.051	0.002	IV	0.12

7. Number of Tests

7.1 One set of test specimens as prescribed in Section 8 shall be considered sufficient for testing each batch. The average result of the specimens tested shall conform to the requirements of this specification.

8. Specimen Preparation

8.1 *Conditioning*—For those tests where conditioning is required, condition the test specimens in accordance with Procedure A of Practice D 618 for a period of at least 24 h prior to test.

8.2 *Test Conditions*—Unless otherwise specified, conduct tests at the Standard Laboratory Temperature of 23 ± 2°C (70 to 77°F) and at 50 ± 5 % relative humidity.

8.3 *Preparation of Specimens*—Take test specimens across the width of the roll.

9. Test Methods

9.1 *Thickness*—Measure the thickness of the sheet of film in accordance with Test Methods D 374, Method A or C. Measure the sample across the web width at 25-mm (1-in.) increments. All readings shall be within the specified tolerances. Abnormal readings may occasionally result from spot imperfections. Discard such readings and take new readings in the same area (excluding the defect).

9.2 *Tensile Strength and Elongation*—Determine tensile strength and elongation of the sheet or film in accordance with