



Standard Classification System and Basis for Specification for Specifying Plastic Films¹

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1. Scope

1.1 This standard provides a classification system for tabulating the properties of unfilled, single-layer plastic films.

NOTE 1—The classification system serves many of the needs of industries using plastic films. The standard is subject to revision as the need requires; therefore, the latest revision should always be used.

NOTE 2—Film is defined in Terminology D883 as an optional term for sheeting having a nominal thickness no greater than 0.25 mm [0.010 in.].

1.2 The classification system and subsequent line call-out (specification) is intended to be a means of identifying plastic films used for applications including industrial, packaging, construction, and agriculture. It is not intended for the selection of materials to be used in films. This selection should be made by those having expertise in the plastics field after careful consideration of the end-use requirements, the environment to which the films will be exposed, the fabrication process to be employed, the inherent properties of the material not covered in this document, and the economic factors.

1.3 This classification system is based on the premise that plastic films can be arranged into broad generic families based on materials with similar composition using basic film properties. A system is thus established which, together with values describing additional requirements, permits as complete a description as desired of the selected film.

1.4 In all cases where the provisions of this classification system would conflict with the referenced ASTM specification for a particular film product, the latter shall take precedence.

NOTE 3—It is strongly recommended that this classification system be used for all new applications and specifications and that the specification of films using existing standards be expeditiously withdrawn or converted to this classification system.

1.5 This classification system applies to commercial products and, as such, there is no control over the manufacturing parameters employed in producing the film. It shall be the responsibility of those developing the specification documents utilizing this classification system to identify the critical parameters and values to be used for the cell classifications and suffix requirements.

¹ This standard is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.19 on Film, Sheeting, and Molded Products.

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1.6 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.7 *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 4—There is no known ISO equivalent to this standard.

2. Referenced Documents

2.1 ASTM Standards:

- D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
- D150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
- D257 Test Methods for DC Resistance or Conductance of Insulating Materials
- D774/D774M Test Method for Bursting Strength of Paper (Withdrawn 2010)²
- D882 Test Method for Tensile Properties of Thin Plastic Sheeting
- D883 Terminology Relating to Plastics
- D1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics
- D1004 Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
- D1203 Test Methods for Volatile Loss From Plastics Using Activated Carbon Methods
- D1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
- D1239 Test Method for Resistance of Plastic Films to Extraction by Chemicals
- D1434 Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting

² The last approved version of this historical standard is referenced on www.astm.org.



D1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method

D1746 Test Method for Transparency of Plastic Sheeting

D1790 Test Method for Brittleness Temperature of Plastic Sheeting by Impact

D1894 Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting

D1922 Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method

D1938 Test Method for Tear-Propagation Resistance (Trouser Tear) of Plastic Film and Thin Sheeting by a Single-Tear Method

D2176 Test Method for Folding Endurance of Paper by the M.I.T. Tester (Withdrawn 2010)²

D2275 Test Method for Voltage Endurance of Solid Electrical Insulating Materials Subjected to Partial Discharges (Corona) on the Surface

D2305 Test Methods for Polymeric Films Used for Electrical Insulation

D2457 Test Method for Specular Gloss of Plastic Films and Solid Plastics

D2578 Test Method for Wetting Tension of Polyethylene and Polypropylene Films

D2582 Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting

D2732 Test Method for Unrestrained Linear Thermal Shrinkage of Plastic Film and Sheeting

D2838 Test Method for Shrink Tension and Orientation Release Stress of Plastic Film and Thin Sheeting

D2923 Test Method for Rigidity of Polyolefin Film and Sheeting (Withdrawn 2015)²

D3354 Test Method for Blocking Load of Plastic Film by the Parallel Plate Method

D3417 Test Method for Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry (DSC) (Withdrawn 2004)²

D3420 Test Method for Pendulum Impact Resistance of Plastic Film

D3801 Test Method for Measuring the Comparative Burning Characteristics of Solid Plastics in a Vertical Position

D3892 Practice for Packaging/Packing of Plastics

D3985 Test Method for Oxygen Gas Transmission Rate Through Plastic Film and Sheeting Using a Coulometric Sensor

D4272/D4272M Test Method for Total Energy Impact of Plastic Films by Dart Drop

D5946 Test Method for Corona-Treated Polymer Films Using Water Contact Angle Measurements

D6988 Guide for Determination of Thickness of Plastic Film Test Specimens

D7192 Test Method for High Speed Puncture Properties of Plastic Films Using Load and Displacement Sensors

D7209 Guide for Waste Reduction, Resource Recovery, and Use of Recycled Polymeric Materials and Products (Withdrawn 2015)²

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E96/E96M Test Methods for Water Vapor Transmission of Materials

F88 Test Method for Seal Strength of Flexible Barrier Materials

3. Terminology

3.1 *Definitions*—The definitions used in this classification system are in accordance with Terminology **D883**.

4. Significance and Use

4.1 The purpose of this classification system is to provide a method of adequately identifying plastic films using a system that applies universally for plastic films. It further provides a means for specifying these films by the use of a simple line call-out designation.

4.2 This classification system was developed to permit the addition of additional film products and property values.

4.3 It is intended that the classification of plastic sheeting, >0.25 mm [0.010 in.] thickness, multi-layer structures, blends, and other variants will be addressed in related standards.

5. Classification

5.1 Films shall be classified by their generic polymer composition, specific sub-group, type, and other defining characteristics as shown in the following examples.

NOTE 5—It should be emphasized that the scope of the following examples and tables are not limited to the information shown and can be supplemented to include additional materials, descriptors, properties, etc. as needed.

5.2 Generic classification shall follow the examples shown in **Table 1** or, in accordance with **D883**, followed by the letter “F” for film.

5.3 If applicable, the film is further classified by sub-groups and types identified by a single-digit numerical codes as shown by the examples described in **Tables 2-4**.

5.4 The film shall be further classified with two single digits to describe the process used to manufacture the film and the film gauge as shown by the examples shown in **Table 5**.

NOTE 6—Example (1), a Low density Polyethylene blown film, nominal gauge of 15 μ – PEF3011.

NOTE 7—Example (2), a Polypropylene random propylene copolymer biaxially-oriented stretch film, nominal gauge of 40 μ – PPF2042.

6. Basic Requirements

6.1 A line call-out assembled using this classification system becomes a specification. The line call-out shall refer to the standard used and contain the broad and specific type of plastic, together with the appropriate identifiers followed by

TABLE 1 Examples of Generic Classifications (Based on Existing Standards)

Generic Classifications	
PE	Polyethylene
PP	Polypropylene
PET	Poly(ethylene terephthalate)
PVC	Poly(vinyl chloride)

**TABLE 2 Examples of Group Classifications (for PE Films)**

Group Classifications	
0	Not applicable
1	Linear low density polyethylene plastics (LLDPE)
2	Linear medium density polyethylene plastics (LMDPE)
3	Low density polyethylene plastics (LDPE)
4	Medium density polyethylene plastics (MDPE)
5	High density polyethylene plastics (HDPE)

TABLE 3 Examples of Group Classifications (for PP Films)

Group Classifications	
0	Not applicable
1	Homopolymer polypropylene (HPP)
2	Random copolymer polypropylene (RPP)
3	Impact copolymer polypropylene (CPP)

TABLE 4 Examples of Type Classifications

Type Classifications	
0	Not applicable
1	Unplasticized
2	Plasticized

special suffix requirements, as they apply. The following summarizes the line call-out and the entire system as detailed in this standard.

7. Suffix Requirements

7.1 When specific requirements are needed to supplement the general classifications, they shall be specified through the use of suffixes. In general, the first suffix letter indicates the special requirement needed and sufficient digits are used to indicate the specific requirements.

NOTE 8—When using the suffixes for specific requirements, the user must keep in mind that not all tests are routinely conducted by the supplier. When these requirements are necessary to identify particular characteristics important to specific applications they shall be specified.

7.1.1 In many cases, it is necessary to specify properties in both the machine and transverse directions due to the effects of orientation. In order to avoid lengthy and cumbersome call-outs, it is recommended that the specific requirements be limited in number to five (5) and represent only the more critical properties. Additional test methods that can be used to provide further characterization of films are to be found in [Appendix X1](#).

NOTE 9—The specific critical properties will, most likely, vary with the generic classification.

7.2 Although the values listed in cell tables include the range of properties available in existing materials, that does not imply that every possible combination of properties exists or can be obtained.

7.3 The specific test procedure and conditions to be used shall be specified or referenced in the cell table of the classification document.

7.4 Examples of typical suffix requirements, using PE as an example, are shown in [Tables 6-10](#). In this case, the critical properties selected are tensile properties, dart drop impact, propagation-tear resistance. Haze, and COF.

NOTE 10—Example (1), PEF3011-A232340-B3-C34-D2-E22—a Low density Polyethylene blown film, nominal gauge of 25 m, tensile yield stress MD (10 MPa), tensile break strain MD (150 %), tensile modulus MD (400 MPa), tensile yield stress TD (20 MPa), tensile break strain TD (300 %), tensile modulus TD (Not Specified), dart impact strength (125 g), propagation tear MD (150 g), propagation tear TD (600 g), Haze (3 %), Static COF (0.25), and Kinetic COF (0.30).

7.5 The above are examples as specific properties and values shall be identified in the appropriate film classification documents.

7.6 The property requirement tables for specific generic films shall reference the appropriate test methods for all properties specified by the suffixes.

8. General Requirements

8.1 The composition of the specified films shall be uniform and shall conform to the requirements specified herein.

9. Detail Requirements

9.1 The film shall conform to the requirements prescribed in the appropriate table (generic classification and suffix) as they apply.

9.2 For the purpose of determining conformance with this classification system, all specified limits used in the specific standards, are absolute limits as defined in [Practice E29](#).

9.3 With the absolute method, an observed value or a calculated value is not rounded, but is to be compared directly with the specified limiting value. Conformance or nonconformance with the specification is based on this comparison.

10. Sampling

10.1 Sampling shall be statistically adequate to satisfy the requirements of [14.4](#). A lot of film shall be considered as a unit of manufacture as prepared for shipment, and can consist of two or more “production runs” or batches.

11. Number of Tests

11.1 The number of tests conducted shall be consistent with the requirements of [10.1](#) and [14.4](#).

12. Specimen Preparation and Conditioning

12.1 The test specimens shall be prepared and conditioned as specified in the appropriate ASTM test procedures cited.

13. Test Methods

13.1 Determine the properties enumerated in this classification system by means of the test procedures cited.

14. Inspection and Certification

14.1 Inspection and certification of the material supplied under this classification system shall be for conformance to the requirements specified herein.

14.2 Lot-acceptance inspection shall be the basis on which acceptance or rejection of the lot is made. The lot-acceptance inspection shall consist of those tests which ensure process control during manufacture as well as those necessary to ensure certifiability in accordance with [14.4](#).



TABLE 5 Examples of Fabrication Process and Nominal Gauge Classifications

Designation	1	2	3	4	5	6	0
Fabrication Process	Blown Film	Cast Film	Stretch Film (Uniaxial)	Stretch Film (Biaxial)	Calendar	Other	Not Specified
Nominal Gauge	≤25	>25-≤50	>50-≤75	>75-≤125	>125-≤175	>175-250	Not Specified

TABLE 6 Table “A” Example of Tensile Property Requirements (D882)

Position 1	Description	Designation					
		1	2	3	4	5	0
Tensile Stress at Yield	MD (MPa)	<5	>5-≤15	>15-≤25	>25-≤35	>35	NS
Position 2	Description	1	2	3	4	5	0
Tensile Strain at Break	MD (%)	<50	>50-≤100	>100-≤200	>200-≤500	>500	NS
Position 3	Description	1	2	3	4	5	0
Tensile Modulus	MD (MPa)	<350	>350-≤550	>550-≤1050	>1050-≤1550	>1550	NS
Position 4	Description	1	2	3	4	5	0
Tensile Stress at Yield	TD (MPa)	<5	>5-≤15	>15-≤25	>25-≤35	>35	NS
Position 5	Description	1	2	3	4	5	0
Tensile Strain at Break	TD (%)	<50	>50-≤100	>100-≤200	>200-≤500	>500	NS
Position 6	Description	1	2	3	4	5	0
Tensile Modulus	TD (MPa)	<350	>350-≤550	>550-≤1050	>1050-≤1550	>1550	NS

NS = Not Specified

TABLE 7 Table “B” Example of Dart Drop Impact Requirements (D1709)

Description	Designation					
	1	2	3	4	5	0
Dart Impact Strength (g)	≤40	>40-≤70	>70-≤150	>150-≤300	>300	NS

NS = Not Specified

TABLE 8 Table “C” Example of Propagation Tear Requirements (D1922)

Description	Designation					
	1	2	3	4	5	0
Propagation Tear MD (gf)	<50	>50-≤100	>100-≤500	>500-≤750	>750	NS
Propagation Tear TD (gf)	<50	>50-≤100	>100-≤500	>500-≤750	>750	NS

NS = Not Specified

TABLE 9 Table “D” Example of Haze Requirements (D1003)

Description	Designation					
	1	2	3	4	5	0
Haze (%)	≤1	>1-≤5	>5-≤10	>10-≤20	>20	NS

NS = Not Specified

TABLE 10 Table “E” Example of COF Requirements (D1894)

Position 1	Description	Designation					
		1	2	3	4	5	0
Static COF	—	≤0.1	>0.1-≤0.5	>0.5-≤0.75	>0.75-≤1	>1	NS
Position 2	Description	1	2	3	4	5	0
Kinetic COF	—	≤0.1	>0.1-≤0.5	>0.5-≤0.75	>0.75-≤1	>1	NS

NS = Not Specified

14.3 Periodic check inspection shall consist of the tests specified for all requirements of the material under this classification system. Inspection frequency shall be adequate to ensure the material is certifiable in accordance with 14.4.

14.4 Certification shall be that the material was manufactured by a process in statistical control, sampled, tested, and inspected in accordance with this classification system, and

that average values for the lot meet the requirements of the specification (line call-out).

14.5 A report of the test results shall be furnished when requested. The report shall consist of results of the lot-acceptance inspection for the shipment and the results of the most recent periodic-check inspection.

NOTE 11—If recycled plastics are allowed in the standard, insert the

following phrase after the word “shipment” in the last sentence of 14.5: “and the percent by weight of recycled plastic, as defined in 3.1 of Guide D7209, if requested.”

15. Packaging, Packing, and Marking

15.1 Provisions of Practice D3892 apply for packaging, packing, and marking of plastic materials.

APPENDIX

(Nonmandatory Information)

X1. ADDITIONAL TEST METHODS AND CONDITIONS

X1.1 Table X1.1 summarizes the test methods that can be used to characterize films.

TABLE X1.1 Film Test Methods

Test Procedure
D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
D150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
D257 Test Methods for DC Resistance or Conductance of Insulating Materials
D774/D774M Test Method for Bursting Strength of Paper (Withdrawn 2010)
D882 Test Method for Tensile Properties of Thin Plastic Sheeting
D1004 Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
D1203 Test Methods for Volatile Loss From Plastics Using Activated Carbon Methods
D1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
D1239 Test Method for Resistance of Plastic Films to Extraction by Chemicals
D1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method
D1790 Test Method for Brittleness Temperature of Plastic Sheeting by Impact
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D2176 Test Method for Folding Endurance of Paper by the M.I.T. Tester (Withdrawn 2010)
D2275 Test Method for Voltage Endurance of Solid Electrical Insulating Materials Subjected to Partial Discharges (Corona) on the Surface
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D2578 Test Method for Wetting Tension of Polyethylene and Polypropylene Films
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D2838 Test Method for Shrink Tension and Orientation Release Stress of Plastic Film and Thin Sheeting
D2923 Test Method for Rigidity of Polyolefin Film and Sheeting (Withdrawn 2015)
D3354 Test Method for Blocking Load of Plastic Film by the Parallel Plate Method
D3417 Test Method for Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry (DSC) (Withdrawn 2004)
D3420 Test Method for Pendulum Impact Resistance of Plastic Film
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E96/E96M Test Methods for Water Vapor Transmission of Materials
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