



Designation: D3350 – 21

Standard Specification for Polyethylene Plastics Pipe and Fittings Materials¹

This standard is issued under the fixed designation D3350; 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.

1. Scope*

1.1 This specification covers the identification of polyethylene plastic pipe and fittings materials in accordance with a cell classification system. It is not the function of this specification to provide specific engineering data for design purposes, to specify manufacturing tolerances, or to determine suitability for use for a specific application.

1.1.1 Some plastic pipe and fitting PE compounds classified by this standard are sold as a base material and then combined with other material(s) (for example, color or additive concentrate) by the pipe or fitting manufacturer into a final classified compound either prior to or during production of the final article. This standard, excluding the requirements of [Table 1](#), properties 5 and 6, and [6.1.1](#), can be used for property verification of the incoming base material(s) in accordance with [8.1](#).

1.1.2 In the case of PE compounds sold as the compound classified by the standard, see [8.1](#) regarding property verification of the incoming classified compound.

1.1.3 Compounds with a cell classification value other than '0' for the Hydrostatic Strength Classification (property 6) rely on a defined formulation. The composition of the defined formulation can be obtained from the owner of the formulation.

NOTE 1—Deviations from the defined formulation may affect the Hydrostatic Strength Classification.

1.2 Polyethylene plastic materials, being thermoplastic, are reprocessible and recyclable ([Note 3](#)). This specification allows for the use of those polyethylene materials, provided that all specific requirements of this specification are met.

NOTE 2—The notes in this specification are for information only and shall not be considered part of this specification.

NOTE 3—See Guide [D5033](#) for information and definitions related to recycled plastics.

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

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

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

1.5 For information regarding molding and extrusion materials see Specification [D4976](#). For information regarding wire and cable materials see Specification [D1248](#).

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- [D618 Practice for Conditioning Plastics for Testing](#)
- [D638 Test Method for Tensile Properties of Plastics](#)
- [D746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact](#)
- [D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials](#)
- [D792 Test Methods for Density and Specific Gravity \(Relative Density\) of Plastics by Displacement](#)
- [D883 Terminology Relating to Plastics](#)
- [D1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer](#)
- [D1248 Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable](#)
- [D1505 Test Method for Density of Plastics by the Density-Gradient Technique](#)
- [D1603 Test Method for Carbon Black Content in Olefin Plastics](#)
- [D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics](#)
- [D1898 Practice for Sampling of Plastics](#) (Withdrawn 1998)³

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 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

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

TABLE 1 Primary Properties^A—Cell Classification Limits

Property	Test Method	0	1	2	3	4	5	6	7	8
1. Density, g/cm ³	D1505	Unspecified	0.925 or lower	>0.925-0.940	>0.940-0.947	>0.947-0.955	>0.955	...	Specify Value	
2. Melt index	D1238	Unspecified	>1.0	1.0 to 0.4	<0.4 to 0.15	<0.15 ^B	^C		Specify Value	
3. Flexural modulus, MPa (psi)	D790	Unspecified	<138 (<20 000)	138- <276 (20 000 to <40 000)	276- <552 (40 000 to 80 000)	552- <758 (80 000 to 110 000)	758- <1103 (110 000 to <160 000)	>1103 (>160 000)	Specify Value	
4. Tensile strength at yield, MPa (psi)	D638	Unspecified	<15 (<2200)	15-<18 (2200-<2600)	18-<21 (2600-<3000)	21-<24 (3000-<3500)	24-<28 (3500-<4000)	>28 (>4000)	Specify Value	
5. Slow Crack Growth Resistance										
I. ESCR	D1693	Unspecified								
a. Test condition (100% Igepal.) ^D			A	B	C	C	...	...	...	Specify Value
b. Test duration, h			48	24	192	600				
c. Failure, max, %		Unspecified	50	50	20	20				
II. PENT (hours)	F1473	Unspecified	...	...	...	10	30	100	500	Specify Value
Molded plaque, 80°C, 2.4 MPa		Unspecified								
Notch depth, F1473 , Table 1		Unspecified								
6. Hydrostatic Strength Classification										
I. Hydrostatic design basis, MPa (psi), (23°C)	D2837	NPR ^E	5.52 (800)	6.89 (1000)	8.62 (1250)	11.03 (1600)	...	...		
II. Minimum required strength, MPa (psi), (20°C)	ISO 12162	...	...	...	...	...	8 (1160)	10 (1450)		

^ACompliance with physical properties in accordance with Section 8 is required including requirements for cell classification, color, and ultraviolet (UV) stabilizer, thermal stability, brittleness temperature, density, tensile strength at yield, and elongation at break.

^BRefer to 10.1.4.1.

^CRefer to 10.1.4.2.

^DThere are environmental concerns regarding the disposal of Nonylphenoxy poly(ethyleneoxy) ethanol (CAS 68412-54-4) for example, Igepal CO-630. Users are advised to consult their supplier or local environmental office and follow the guidelines provided for the proper disposal of this chemical.

^ENPR = Not Pressure Rated.

D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

D2839 Practice for Use of a Melt Index Strand for Determining Density of Polyethylene

D3035 Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

D3892 Practice for Packaging/Packing of Plastics

D4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique

D4703 Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets

D4883 Test Method for Density of Polyethylene by the Ultrasound Technique

D4976 Specification for Polyethylene Plastics Molding and Extrusion Materials

D5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics (Withdrawn 2007)³

F1473 Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins

F2263 Test Method for Evaluating the Oxidative Resistance of Polyethylene (PE) Pipe to Chlorinated Water

2.2 ISO Standard:

ISO 12162 Thermoplastic Materials for Pipes and Fittings for Pressure Applications—Classification and Designation—Overall Service (Design) Coefficient

3. Terminology

3.1 Definitions:

3.1.1 Terms as described in Terminology **D883** shall apply in this specification.

3.1.2 *polyethylene plastics, n*—as defined by this specification, plastics or resins prepared by the polymerization of no less than 85 % ethylene and no less than 95 % of total olefins with additional compounding ingredients.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *base materials, n*—PE material without non-black or black pigment, supplied to industry, that is either a PE compound classified by this Standard or a component of a PE compound classified by this standard.

3.2.2 *PE compounds, n*—has the same meaning as PE plastics materials, compounds, and plastics.