Designation: D 2581 – 02

Standard Classification System for Polybutylene (PB) Plastics Molding and Extrusion Materials[1]

This standard is issued under the fixed designation D 2581; 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 classification system covers polybutylene plastics materials suitable for molding and extrusion.

1.2 This classification system allows for the use of those polybutylene plastic materials that can be recycled, reconstituted, and reground, provided the following conditions are met:

1.2.1 The requirements as stated in this classification system and other guideline pertaining to these materials are met, and

1.2.2 The material has not been modified in any way to alter its conformance to water contact regulations or other similar requirements.

1.3 The proportions of recycled, reconstituted, and regrind material used, as well as the nature and the amount of any contaminant, cannot be practically covered in this classification system. It is the responsibility of the supplier and buyer of recycled, reconstituted, and regrind materials to ensure compliance.

1.4 The properties included in this classification system are those required to characterize and classify the specific product. Other properties may be necessary to identify particular characteristics important to specialized applications. These may be specified by using suffixes as given in Section 5. Properties shall be selected in such a manner that consistency of different lots or shipments is assured. The tests involved in this classification system are intended to provide information for identifying materials in accordance with types and categories. It is not the function of this classification system to provide specific engineering data for design purposes.

1.5 This classification system and subsequent line callout (specification) are intended to provide a means of calling out plastic materials used in the fabrication of end items or parts. It is not intended for the selection of materials. Material selection should be made by those having expertise in the plastic field after careful consideration of the design and the performance required of the part, the environment to which it will be exposed, the fabrication process to be employed, the costs involved, and the inherent properties of the material other than those covered by this standard.

1.6 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

NOTE 1—ISO 8986 Parts 1 and 2 resemble this standard in title, but their content is significantly different.

1.7 The following precautionary caveat pertains only to the test methods portion, Section 11, of this classification system: *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.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 618 Practice for Conditioning Plastics for Testing
D 638 Test Method for Tensile Properties of Plastics
D 792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D 883 Terminology Relating to Plastics
D 1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
D 1600 Terminology for Abbreviated Terms Relating to Plastics
D 1603 Test Method for Carbon Black in Olefin Plastics
D 3892 Practice for Packaging/Packing of Plastics
D 4000 Classification System for Specifying Plastic Materials
D 5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics
E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E 105 Practice for Probability Sampling of Materials
F 699 Practice for Accelerated Conditioning of Polybutylene Pipe and Tubing for Subsequent Quality Control Testing

[1] This classification system is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.12 on Olefin Plastics.

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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.

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

TABLE 1 Classification of Polybutylene Molding and Extrusion Materials According to Type

Type	Density Range, (kg/m^3) g/cm^3
I	0.905 to 0.909
II	> 0.909 to 0.920
II, colored and filled	0.920 to 0.950

TABLE 2 Classification of Polybutylene Molding and Extrusion Materials According to Category

Category	Flow Rate, g/10 min
0	< 0.25
1	≥ 0.25 to 0.75
2	> 0.75 to 2.5
3	> 2.5 to 10
4	> 10 to 25
5	> 25

2.2 *Military Standard:*

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes[3]

3. Terminology

3.1 Except for the terms defined below, the terminology used in this classification system is in accordance with Terminologies D 883 and D 1600.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *internal recycled material*—clean rework material generated from the manufacturer's own resin production.

3.2.2 *polybutylene plastics*—plastics prepared by the polymerization of no less than 85 % butene-1 and no less than 95 % of total olefins by weight.

4. Classification

4.1 This classification system recognizes that polybutylene plastics are identified on the basis of two characteristics, that is, density and flow rate. The former is the criterion for assignment as to type, the latter for designation as to category.

4.2 *Types*—This classification system provides for three types of polybutylene molding and extrusion materials in accordance with the requirements in Table 1. Material supplied under these types shall be of such nominal density, within the ranges given.

4.3 *Categories*—This classification system provides for six grades of polybutylene on the basis of flow rate ranges in accordance with the requirements of Table 2. Material supplied under these grades shall be of such nominal flow rate, within the ranges given.

4.4 *Classes*—Each of the three types is subdivided into three classes, in accordance with use and composition, as follows:

4.4.1 *Class A*—General-purpose and dielectric, unpigmented.

4.4.2 *Class B*—General-purpose and dielectric, in colors (including black and white).

4.4.3 *Class C*—Weather-resistant (black) containing not less than 2 % carbon black. The carbon black shall be of a kind and particle size (Note 2), and dispersed by such means and to such degree, as agreed upon between the manufacturer and the purchaser.

NOTE 2—Carbon black, 20 nm or less in average particle diameter, is used, as required, in black electrical and jacketing materials to impart maximum weather resistance.

4.5 Material in any of the preceding three classes may be supplied with or without any antioxidant or other additive as appropriate.

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

5. Suffixes

5.1 When additional requirements are needed that are not covered by the basic requirements or cell-table requirements, they shall be indicated through the use of suffixes.

5.2 A list of suffixes can be found in Classification System D 4000 (Table 3) and may be used for additional requirements as appropriate. Additional suffixes will be added to that standard as test methods and requirements are developed and requested.

6. General Requirements

6.1 Basic requirements from the property tables are always in effect unless superseded by specific suffix requirements, which always take precedence.

6.2 The compound, in the form of molding powder, granules, or pellets, shall be of uniform composition and so formulated as to conform to the requirements of this classification system.

6.3 The compound shall be as free of foreign matter as can be achieved by good manufacturing practice and as appropriate for the application.

7. Detail Requirements

7.1 *Extrusion and Molding Compound*—Molded test specimens shall conform to the requirements prescribed for the particular type and category in Table 1, Table 2, and Table 3 and suffix requirements as they apply.

7.2 For purposes of determining conformance, all specified limits for the specification (line callout) based on this classification system are absolute limits, as defined in Practice E 29.

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

8. Sampling

8.1 The compound shall be sampled in accordance with the sampling procedure described in Practice E 105. Adequate statistical sampling prior to packaging shall be considered an acceptable alternative. Sampling shall be statistically adequate to satisfy the requirements of 12.4.

8.2 A batch or lot of molding material shall be considered as a unit of manufacture as prepared for shipment, and may consist of a blend of two or more production runs of material.

9. Specimen Preparation and Number of Tests

9.1 Unless otherwise specified, test specimens shall be compression-molded under conditions recommended by the manufacturer.