



Designation: D4000 – 10a

Standard Classification System for Specifying Plastic Materials¹

This standard is issued under the fixed designation D4000; 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 standard provides a classification system for tabulating the properties of unfilled, filled, and reinforced plastic materials suitable for processing into parts.

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

1.2 The classification system and subsequent line callout (specification) is intended to be a means of identifying 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 plastics 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 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 materials can be arranged into broad generic families using basic properties to arrange the materials into groups, classes, and grades. A system is thus established which, together with values describing additional requirements, permits as complete a description as desired of the selected material.

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

NOTE 2—When using this classification system the two-letter, three-digit suffix system applies.

NOTE 3—When a material is used to fabricate a part where the requirements are too specific for a broad material callout, it is advisable for the user to consult the supplier to secure callout of the properties to suit the actual conditions to which the part is to be subjected.

1.5 *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 appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:²

- 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
- D256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
- D257 Test Methods for DC Resistance or Conductance of Insulating Materials
- D395 Test Methods for Rubber Property—Compression Set
- D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- D471 Test Method for Rubber Property—Effect of Liquids
- D495 Test Method for High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation
- D569 Method for Measuring the Flow Properties of Thermoplastic Molding Materials³
- D570 Test Method for Water Absorption of Plastics
- D573 Test Method for Rubber—Deterioration in an Air Oven
- D575 Test Methods for Rubber Properties in Compression
- D618 Practice for Conditioning Plastics for Testing
- D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
- D635 Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
- D638 Test Method for Tensile Properties of Plastics
- D648 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
- D695 Test Method for Compressive Properties of Rigid Plastics

¹ This classification system is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.94 on Government/Industry Standardization (Section D20.94.01).

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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 Withdrawn.

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

- D706** Classification System and Basis for Specifications for Cellulose Acetate Molding and Extrusion Compounds
- D707** Classification System and Basis for Specification for Cellulose Acetate Butyrate Molding and Extrusion Compounds
- D747** Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam
- D785** Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
- D787** Specification for Ethyl Cellulose Molding and Extrusion Compounds
- D788** Classification System for Poly(Methyl Methacrylate) (PMMA) Molding and Extrusion Compounds
- D789** Test Methods for Determination of Solution Viscosities of Polyamide (PA)
- 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
- D955** Test Method of Measuring Shrinkage from Mold Dimensions of Thermoplastics
- D1003** Test Method for Haze and Luminous Transmittance of Transparent Plastics
- D1004** Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheet
- D1149** Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
- D1203** Test Methods for Volatile Loss From Plastics Using Activated Carbon Methods
- D1238** Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- D1248** Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- D1349** Practice for Rubber—Standard Temperatures for Testing
- D1430** Classification System for Polychlorotrifluoroethylene (PCTFE) Plastics
- D1434** Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheet
- D1435** Practice for Outdoor Weathering of Plastics
- D1499** Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics
- D1505** Test Method for Density of Plastics by the Density-Gradient Technique
- D1525** Test Method for Vicat Softening Temperature of Plastics
- D1562** Classification System and Basis for Specification for Cellulose Acetate Propionate Molding and Extrusion Compounds
- D1600** Terminology for Abbreviated Terms Relating to Plastics
- D1693** Test Method for Environmental Stress-Cracking of Ethylene Plastics
- D1784** Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- D1822** Test Method for Tensile-Impact Energy to Break Plastics and Electrical Insulating Materials
- D1929** Test Method for Determining Ignition Temperature of Plastics³
- D2116** Specification for FEP-Fluorocarbon Molding and Extrusion Materials
- D2137** Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics
- D2240** Test Method for Rubber Property—Durometer Hardness
- D2287** Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
- D2288** Test Method for Weight Loss of Plasticizers on Heating³
- D2565** Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications
- D2583** Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
- D2584** Test Method for Ignition Loss of Cured Reinforced Resins
- D2632** Test Method for Rubber Property—Resilience by Vertical Rebound
- D2843** Test Method for Density of Smoke from the Burning or Decomposition of Plastics
- D2863** Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
- D2951** Test Method for Resistance of Types III and IV Polyethylene Plastics to Thermal Stress-Cracking³
- D3012** Test Method for Thermal-Oxidative Stability of Polypropylene Using a Specimen Rotator Within an Oven
- D3159** Specification for Modified ETFE-Fluoropolymer Molding and Extrusion Materials
- D3222** Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials
- D3275** Classification System for E-CTFE-Fluoroplastic Molding, Extrusion, and Coating Materials
- D3294** Specification for Polytetrafluoroethylene (PTFE) Resin Molded Sheet and Molded Basic Shapes
- D3295** Specification for PTFE Tubing, Miniature Beading and Spiral Cut Tubing
- D3296** Specification for FEP-Fluorocarbon Tube
- D3307** Specification for Perfluoroalkoxy (PFA)-Fluorocarbon Resin Molding and Extrusion Materials
- D3350** Specification for Polyethylene Plastics Pipe and Fittings Materials
- D3418** Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry
- D3595** Specification for Polychlorotrifluoroethylene (PCTFE) Extruded Plastic Sheet and Film
- D3638** Test Method for Comparative Tracking Index of Electrical Insulating Materials
- D3713** Test Method for Measuring Response of Solid Plastics to Ignition by a Small Flame³
- D3763** Test Method for High Speed Puncture Properties of Plastics Using Load and Displacement Sensors

- D3801** Test Method for Measuring the Comparative Burning Characteristics of Solid Plastics in a Vertical Position
- D3892** Practice for Packaging/Packing of Plastics
- D3895** Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
- D3915** Specification for Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Pressure Applications
- D3935** Specification for Polycarbonate (PC) Unfilled and Reinforced Material
- D3965** Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings
- D3985** Test Method for Oxygen Gas Transmission Rate Through Plastic Film and Sheeting Using a Coulometric Sensor
- D4020** Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials
- D4066** Classification System for Nylon Injection and Extrusion Materials (PA)
- D4067** Classification System for Reinforced and Filled Poly(Phenylene Sulfide) (PPS) Injection Molding and Extrusion Materials Using ASTM Methods
- D4101** Specification for Polypropylene Injection and Extrusion Materials
- D4203** Specification for Styrene-Acrylonitrile (SAN) Injection and Extrusion Materials
- D4216** Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly(Vinyl Chloride) (CPVC) Building Products Compounds
- D4329** Practice for Fluorescent UV Exposure of Plastics
- D4349** Classification System for Polyphenylene Ether (PPE) Materials
- D4364** Practice for Performing Outdoor Accelerated Weathering Tests of Plastics Using Concentrated Sunlight
- D4396** Specification for Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Nonpressure Applications
- D4441** Specification for Aqueous Dispersions of Polytetrafluoroethylene
- D4474** Classification System for Styrenic Thermoplastic Elastomer Injection Molding and Extrusion Materials (TES)³
- D4549** Specification for Polystyrene and Rubber-Modified Polystyrene Molding and Extrusion Materials (PS)
- D4617** Classification System for Phenolic Compounds (PF)
- D4634** Specification for Styrene-Maleic Anhydride Materials (S/MA)
- D4673** Classification System for Acrylonitrile-Butadiene-Styrene (ABS) Plastics and Alloys Molding and Extrusion Materials
- D4745** Specification for Filled Compounds of Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials
- D4804** Test Method for Determining the Flammability Characteristics of Nonrigid Solid Plastics
- D4812** Test Method for Unnotched Cantilever Beam Impact Resistance of Plastics
- D4894** Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials
- D4895** Specification for Polytetrafluoroethylene (PTFE) Resin Produced From Dispersion
- D4976** Specification for Polyethylene Plastics Molding and Extrusion Materials
- D4986** Test Method for Horizontal Burning Characteristics of Cellular Polymeric Materials
- D5021** Specification for Thermoplastic Elastomer-Chlorinated Ethylene Alloy (TECEA)³
- D5046** Classification for Fully Crosslinked Elastomeric Alloys (FCEAs)³
- D5048** Test Method for Measuring the Comparative Burning Characteristics and Resistance to Burn-Through of Solid Plastics Using a 125-mm Flame
- D5132** Test Method for Horizontal Burning Rate of Polymeric Materials Used in Occupant Compartments of Motor Vehicles
- D5138** Classification System for Liquid Crystal Polymers (LCP)
- D5203** Specification for Polyethylene Plastics Molding and Extrusion Materials from Recycled Post-Consumer (HDPE) Sources
- D5204** Classification System for Polyamide-Imide (PAI) Molding and Extrusion Materials
- D5205** Classification System for Polyetherimide (PEI) Materials
- D5260** Classification for Chemical Resistance of Poly(Vinyl Chloride) (PVC) Homopolymer and Copolymer Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- D5279** Test Method for Plastics: Dynamic Mechanical Properties: In Torsion
- D5336** Specification for Polyphthalamide (PPA) Injection Molding Materials
- D5420** Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
- D5436** Specification for Cast Poly(Methyl Methacrylate) Plastic Rods, Tubes, and Shapes
- D5476** Classification System for Thermoplastic Polyurethane Materials (TPU)³
- D5575** Classification System for Copolymers of Vinylidene Fluoride (VDF) with Other Fluorinated Monomers
- D5593** Classification for Thermoplastic Elastomers—Olefinic (TEO)³
- D5628** Test Method for Impact Resistance of Flat, Rigid Plastic Specimens by Means of a Falling Dart (Tup or Falling Mass)
- D5630** Test Method for Ash Content in Plastics
- D5676** Specification for Recycled Polystyrene Molding and Extrusion Materials³
- D5857** Specification for Polypropylene Injection and Extrusion Materials Using ISO Protocol and Methodology
- D5927** Classification System for Thermoplastic Polyester (TPES) Injection and Extrusion Materials Based on ISO Test Methods

- D5990** Classification System for Polyketone Injection Molding and Extrusion Materials (PK)³
- D6314** Specification for Fluorocarbon Perfluoromethoxy (MFA) Resin Molding and Extrusion Materials³
- D6338** Classification System for Highly Crosslinked Thermoplastic Vulcanizates (HCTPVs) Based on ASTM Standard Test Methods
- D6339** Specification for Syndiotactic Polystyrene Molding and Extrusion (SPS)
- D6358** Classification System for Poly (Phenylene Sulfide) Injection Molding and Extrusion Materials Using ISO Methods
- D6360** Practice for Enclosed Carbon-Arc Exposures of Plastics
- D6394** Specification for Sulfone Plastics (SP)
- D6457** Specification for Extruded and Compression Molded Rod and Heavy-Walled Tubing Made from Polytetrafluoroethylene (PTFE)
- D6585** Specification for Unsintered Polytetrafluoroethylene (PTFE) Extruded Film or Tape
- D6778** Classification for Polyoxymethylene (POM, Acetal) Molding and Extrusion Materials
- D6779** Classification System for Polyamide Molding and Extrusion Materials (PA)
- D6835** Classification System for Thermoplastic Elastomer-Ether-Ester Molding and Extrusion Materials (TEEE)
- D6865** Classification System for Acrylonitrile–Styrene–Acrylate (ASA) and Acrylonitrile–EPDM–Styrene (AES) Plastics and Alloys Molding and Extrusion Materials
- D6869** Test Method for Coulometric and Volumetric Determination of Moisture in Plastics Using the Karl Fischer Reaction (the Reaction of Iodine with Water)
- D7209** Guide for Waste Reduction, Resource Recovery, and Use of Recycled Polymeric Materials and Products
- E29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E84** Test Method for Surface Burning Characteristics of Building Materials
- E96/E96M** Test Methods for Water Vapor Transmission of Materials
- E104** Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions
- E119** Test Methods for Fire Tests of Building Construction and Materials
- E162** Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
- E662** Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- E1354** Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- F372** Test Method for Water Vapor Transmission Rate of Flexible Barrier Materials Using an Infrared Detection Technique³
- G21** Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- 2.2 *Federal Standard:*⁴
Department of Transportation Federal Motor Vehicle Safety Standard No. 302
- 2.3 *Underwriters Laboratories:*⁵
UL94 Standards for Tests for Flammability for Parts in Devices and Appliances
- 2.4 *IEC and ISO Standards:*⁶
IEC 600093 Recommended Methods of Tests for Volume and Surface Resistivities of Electrical Insulation Materials
IEC 600112 Recommended Method for Determining the Comparative Tracking Index of Solid Insulation Materials Under Moist Conditions
IEC 600243 Recommended Methods of Test for Electrical Strength of Solid Insulating Materials at Power Frequencies
IEC 600250 Recommended Methods for the Determination of the Permittivity and Dielectric Dissipation Factor of Electrical Insulation Materials at Power, Audio, and Radio Frequencies Including Metre Wavelengths
IEC 60695-2-12 Fire Hazard Testing—Part 2-12: Glowing/Hot-Wire Based Test Methods—Glow-Wire Flammability Test Method for Materials
IEC 60695-11-10 Fire Hazard Testing—Part 11-10: Test Flames—50 W Horizontal and Vertical Flame Tests
IEC 60695-11-20 Fire Hazard Testing—Part 11-20: Test Flames—500 W Flame Test Methods
ISO 34-1 Rubber, Vulcanized or Thermoplastic—Determination of Tear Strength—Part 1: Trouser, Angle, and Crescent Test Pieces
ISO 62 Plastics—Determination of Water Absorption
ISO 75-1 Plastics—Determination of Temperature of Deflection Under Load—Part 1: General Principles
ISO 75-2 Plastics—Determination of Temperature of Deflection Under Load—Part 2: Plastics and Ebonite
ISO 105-A02 Textiles—Tests for Colour Fastness—Part A02: Grey Scale for Assessing Change in Colour
ISO 178 Plastics—Determination of Flexural Properties of Rigid Plastics
ISO 179 Plastics—Determination of Charpy Impact Strength of Rigid Materials
ISO 180 Plastics—Determination of Izod Impact Strength of Rigid Materials
ISO 188 Rubber, Vulcanized or Thermoplastic—Accelerated Aging and Heat Resistance Tests
ISO 294-4 Plastics—Injection Moulding of Test Specimens of Thermoplastic Materials—Part 4: Determination of Moulding Shrinkage
ISO 527-1 Plastics—Determination of Tensile Properties—Part 1: General Principles

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

⁵ Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

⁶ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

- ISO 527-2** Plastics—Determination of Tensile Properties—Part 2: Test Conditions for Moulding and Extrusion Plastics
- ISO 604** Plastics—Determination of Compressive Properties
- ISO 868** Plastics—Determination of Indentation Hardness by Means of a Durometer (Shore Hardness)
- ISO 877-3** Plastics—Methods of Exposure to Solar Radiation—Part 3: Intensified Weathering Using Concentrated Solar Radiation
- ISO 974** Plastics—Determination of the Brittleness Temperature by Impact
- ISO 1133** Plastics—Determination of the Melt Mass-Flow Rate (MFR) and the Melt Volume-Flow Rate (MVR) of Thermoplastics
- ISO 1183** Plastics—Methods for Determining the Density and Relative Density of Non-Cellular Plastics
- ISO 2039-2** Plastics—Determination of Hardness—Part 2: Rockwell Hardness
- ISO 3451-1 Plastics—Determination of Ash—Part 1: General Methods
- ISO 3795** Road Vehicles, Tractors, and Machinery for Agriculture and Forestry—Determination of Burning Behavior of Interior Materials
- ISO 4577** Plastics—Polypropylene and Propylene—Copolymers—Determination of Thermal Oxidative Stability in Air-Oven Method
- ISO 4589** Plastics—Determination of Flammability by Oxygen Index
- ISO 4607** Plastics—Method of Exposure to Natural Weathering
- ISO 4892** Plastics—Methods of Exposure to Laboratory Light Sources
- ISO 4892-2 Plastics—Methods of Exposure to Laboratory Light Sources-Part 2: Xenon Arc Lamps
- ISO 4892-3 Plastics—Methods of Exposure to Laboratory Light Sources-Part 3: Fluorescent UV Lamps
- ISO 4892-4** Plastics—Methods of Exposure to Laboratory Light Sources—Part 4: Open-flame Carbon-arc
- ISO 5659** Plastics—Smoke Regeneration—Part 2: Determination of Optical Density by a Single-Chamber Test
- ISO 6603-1** Plastics—Determination of Multiaxial Impact Behavior of Rigid Plastics—Part 1: Falling Dart Method
- ISO 6721-1** Plastics—Determination of Dynamic Mechanical Properties—Part 1: General Principles
- ISO 6721-2** Plastics—Determination of Dynamic Mechanical Properties—Part 2: Torsion-Pendulum Method
- ISO 9772** Cellular Plastics—Determination of Horizontal Burning Characteristics of Small Specimens Subjected to a Small Flame
- ISO 9773** Plastics—Determination of Burning Behaviour of Thin Flexible Vertical Specimens in Contact with a Small-Flame Ignition Source
- ISO 11357-1** Plastics—Differential Scanning Calorimetry—Part 1: General principles
- ISO 11357-3** Plastics—Differential Scanning Calorimetry—Part 3: Determination of Temperature and Enthalpy of Melting and Crystallization
- 2.5 *SAE Standards*.⁷
- J 576 Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices
- J 578 Color Specification
- J 1351 Hot Odor Test for Insulation Materials
- J 1545 Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim
- J 1756 Determination of the Fogging Characteristics of Interior Automotive Materials
- J 1976 Outdoor Weathering of Exterior Materials
- J 2412 Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Irradiance Xenon-Arc Apparatus
- J 2527 Performance Based Standard for Accelerated Exposure of Automotive Exterior Materials Using a Controlled Irradiance Xenon-Arc Apparatus

⁷ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

TABLE 1 Standard Symbols for Generic Families With Referenced Standards and Cell Tables

| Standard Symbol | Plastic Family Name | ASTM ^A Standard | Suggested Reference Cell Tables for Materials Without an ASTM Standard ^B | |
|-----------------|-----------------------------------|-----------------------------------|---|--------|
| | | | Unfilled | Filled |
| ABA | acrylonitrile-butadiene-acrylate | | E | |
| ABS | acrylonitrile-butadiene-styrene | D3965, D4673 | | |
| AMMA | acrylonitrile-methyl methacrylate | | E | |
| ARP | aromatic polyester | (see LCP) | | |
| ASA | acrylonitrile-styrene-acrylate | D6865 | | |
| CA | cellulose acetate | D706 | | |
| CAB | cellulose acetate butyrate | D707 | | |
| CAP | cellulose acetate propionate | | E | D |
| CE | cellulose plastics, general | | E | D |
| CF | cresol formaldehyde | | H | H |
| CMC | carboxymethyl cellulose | | E | |
| CN | cellulose nitrate | | E | D |
| CP | cellulose propionate | D1562 | | |
| CPE | chlorinated polyethylene | | F | |
| CPVC | chlorinated poly(vinyl chloride) | D4396, D1784, D5260, D3915, D4216 | | |
| CS | casein | | H | H |
| CTA | cellulose triacetate | | E | D |

TABLE 1 *Continued*

| Standard Symbol | Plastic Family Name | ASTM ^A Standard | Suggested Reference Cell Tables for Materials Without an ASTM Standard ^B | |
|-----------------|--|--|---|--------|
| | | | Unfilled | Filled |
| EC | ethyl cellulose | D787 | E | D |
| E-CTFE | ethylene-chlorotrifluoroethylene copolymer | D3275 | | |
| EEA | ethylene-ethyl acrylate | | F | |
| EMA | ethylene-methacrylic acid | | F | |
| EP | epoxy, epoxide | | H | H |
| EPD | ethylene-propylene-diene | | | |
| EPM | ethylene-propylene polymer | | F | D |
| ETFE | ethylene-tetrafluoroethylene copolymer | D3159 | | |
| EVA | ethylene-vinyl acetate | | F | |
| FCEA | fully crosslinked elastomeric alloy | D5046 | | |
| FEP | perfluoro (ethylene-propylene) copolymer | D2116 | | |
| FF | furan formaldehyde | D3296 | H | H |
| HCTPV | highly crosslinked thermoplastic vulcanizates | D6338 | | |
| IPS | impact polystyrene | (see PS) | | |
| LCP | liquid crystal polymer | D5138 | | |
| MF | melamine-formaldehyde | | H | H |
| PA | polyamide (nylon) | D4066, D6779 | | |
| PAEK | polyacryletherketone | | | |
| PAI | polyamide-imide | D5204 | G | G |
| PARA | polyacryl amide | | | |
| PB | polybutene-1 | | F | |
| PBT | poly(butylene terephthalate) | (see TPES) | | |
| PC | polycarbonate | D3935 | | |
| PCTFE | polymonochlorotrifluoroethylene | D1430, D3595 | | |
| PDAP | poly(diallyl phthalate) | | H | H |
| PE | polyethylene | D1248, D4976, D3350, D4020, D5203 | | |
| PEBA | polyether block amide | | | |
| PEEK | polyetheretherketone | | | |
| PEI | polyether-imide | D5205 | | |
| PEO | poly(ethylene oxide) | | | |
| PESU | polyether sulfone | D6394 | | |
| PET | poly(ethylene terephthalate), general | (see TPES) | | |
| PETG | glycol modified polyethylene terephthalate comonomer | (see TPES) | | |
| PF | phenol-formaldehyde | D4617 | | |
| PFA | perfluoro alkoxy alkane | D3307 | | |
| PI | polyimide | | G | G |
| PIB | polyisobutylene | | F | |
| PK | polyketone | D5990 | | |
| PMMA | Poly(methyl methacrylate) | D788, D5436 | | D |
| PMP | poly(4-methylpentene-1) | | F | |
| POM | polyoxymethylene (acetal) | D6778 | | |
| POP | polyphenylene oxide | (see PPE) | | |
| PP | polypropylene | D4101, D5857 | | |
| PPA | polyphthalamide | D5336, D6779 | | |
| PPE | polyphenylene ether | D4349 | | |
| PPH | polyphenylene | | G | H |
| PPOX | poly(propylene oxide) | | | |
| PPS | poly(phenylene sulfide) | D4067, D6358 | | |
| PPSU | poly(phenyl sulfone) | D6394 | G | G |
| PS | polystyrene | D4549, D5676 | | |
| PSU | polysulfone | D6394 | | |
| PTFE | polytetrafluoroethylene | D1430, D3159, D3222, D3294, D3295, D3307, D4441, D4745, D4894, D4895, D5575, D6314, D6457, D6585 | | |
| PUR | polyurethane | | F | D |
| PVAC | poly(vinyl acetate) | | F | D |
| PVAL | poly(vinyl alcohol) | | F | D |
| PVB | poly(vinyl butyral) | | F | D |
| PVC | poly(vinyl chloride) | D2287 | F | D |
| PVDC | poly(vinyl idene chloride) | | F | D |
| PVDF | poly(vinyl idene fluoride) | D3222 | | |
| PVF | poly(vinyl fluoride) | | F | D |
| PVFM | poly(vinyl formal) | | F | D |
| PVK | poly(vinylcarbazole) | | F | D |
| PVP | poly(vinyl pyrrolidone) | | F | D |
| SAN | styrene-acrylonitrile | D4203 | | |
| SB | styrene-butadiene | | E | D |
| SI | silicone plastics | | G | G |
| S/MA | styrene-maleic anhydride | D4634 | | |
| SMS | styrene-methylstyrene | | E | D |
| SPS | syndiotactic polystyrene | D6339 | | |
| TECEA | thermoplastic elastomer-chlorinated ethylene alloy | D5021 | | |

TABLE 1 *Continued*

| Standard Symbol | Plastic Family Name | ASTM ^A Standard | Suggested Reference Cell Tables for Materials Without an ASTM Standard ^B | |
|-----------------|--------------------------------------|----------------------------|---|--------|
| | | | Unfilled | Filled |
| TEEE | thermoplastic elastomer, ether-ester | D6835 | | |
| TEO | thermoplastic elastomer-olefinic | D5593 | | |
| TES | thermoplastic elastomer-stryenic | D4474 | | |
| TPE | thermoplastic elastomer | (see individual material) | | |
| TPES | thermoplastic polyester (general) | D5927 | | |
| TPU | thermoplastic polyurethane | D5476 | | |
| UF | urea-formaldehyde | | H | H |
| UP | unsaturated polyester | | | |
| VDF | vinylidene fluoride | D5575 | | |

^AThe standards listed are those in accordance with this classification. D ___ indicates that a standard is being developed by the subcommittee responsible.

^BCell Tables A and B have been reserved for the referenced standards and will apply to unfilled and filled materials covered in those standards.

TABLE 2 Reinforcement-Filler^A Symbols^B and Tolerance

| Symbol | Material | Tolerance |
|--------|---|--|
| C | Carbon and graphite | ±2 percentage points |
| D | Alumina trihydrate | ±2 percentage points |
| E | Clay | ±2 percentage points |
| F | Cellulose | ±2 percentage points |
| G | Glass | ±2 percentage points |
| H | Aramid | ±2 percentage points |
| J | Boron | ±2 percentage points |
| K | Calcium carbonate | ±2 percentage points |
| L | Lubricants (for example, PTFE, graphite, and so forth) | Depends upon material and process, to be specified |
| M | Mineral | ±2 percentage points |
| N | Natural organic (cotton, sisal, hemp, flax, and so forth) | ±2 percentage points |
| P | Mica | ±2 percentage points |
| Q | Silica | ±2 percentage points |
| R | Combinations of reinforcements or fillers, or both | ±3 percentage points |
| S | Synthetic organic | ±2 percentage points |
| T | Talcum | ±2 percentage points |
| V | Metal | ±2 percentage points |
| W | Wood | ±2 percentage points |
| X | Not specified | To be specified |

^AAsh content of filled or reinforced materials, or both may be determined using either Test Method D5630 or ISO 3451-1 where applicable.

^BAdditional symbols may be added to this table as required.

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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 materials in order to give industry a system that can be used universally for plastic materials. It further provides a means for specifying these materials by the use of a simple line call-out designation.

TABLE 2A Symbols for the Form or Structure of Fillers and Reinforcing Materials

| Symbol | Form or Structure |
|--------|--------------------------|
| C | Chips, cuttings |
| D | Fines, powder |
| E | Beads, spheres, balls |
| F | Fiber |
| G | Ground |
| H | Whisker |
| K | Knitted fabric |
| L | Layer |
| M | Mat (fabric, thick) |
| N | Non-woven (fabric, thin) |

| | |
|---|---------------|
| P | Paper |
| R | Roving |
| S | Flake |
| T | Cord |
| V | Veneer |
| W | Woven fabric |
| X | Not specified |
| Y | Yarn |

4.2 This classification system was developed to permit the addition of property values for future plastics.

5. Classification

5.1 Plastic materials shall be classified on the basis of their broad generic family. The generic family is identified by letter designations as found in Table 1. These letters represent the standard abbreviations for plastics in accordance with Terminology D1600.

NOTE 4—For example: PA = polyamide (nylon).

5.1.1 The generic family is based on the broad chemical makeup of the base polymer. By its designation, certain inherent properties are specified.

TABLE 3 Suffix Symbols and Requirements^A

| Symbol | Characteristic |
|--------|--|
| A | <p>Color (unless otherwise shown by suffix, color is understood to be natural)</p> <p>Second letter A = does not have to match a standard B = must match standard</p> <p>Three-digit number 001 = color and standard number on drawing 002 = color on drawing</p> |
| B | <p>Fluid resistance, mildew resistance</p> <p>Second letter A = reference fuel A, ASTM D471, aged 70 h at 23 ± 2°C B = reference fuel C, ASTM D471, aged 70 h at 23 ± 2°C C = ASTM #1 oil, ASTM D471, aged 70 h at 100 ± 2°C D = IRM 902 oil, ASTM D471, aged 96 h at 100 ± 2°C E = IRM 903 oil, ASTM D471, aged 70 h at 100 ± 2°C F = Distilled water, ASTM D471, aged 70 h at 100 ± 2°C</p> <p>Three digit number is obtained from Suffix Table 1. It indicates change in hardness, tensile strength, elongation, and volume. Example: BC 132 specifies that material, after aging in ASTM #1 oil for 70 h at 100°C, can have changed no more than 2 Shore D points, 5 % tensile strength, 15 % elongation, and 5 % in volume.</p> <p>Second letter G = ASTM G21</p> |
| C | <p>Three-digit number 001 = No apparent fungus attack</p> <p>Melting point—softening point</p> <p>Second letter B = ASTM D1525, load 10 N, Rate A (Vicat) C = ASTM D1525, load 10 N, Rate B (Vicat) D = ASTM D3418 (Transition temperature DSC/DTA) (ISO 11357-1 and ISO 11357-3) G = ISO 306, load 10 N, heating rate 50°C/h (Vicat) H = ISO 306, load 10 N, heating rate 120°C/h (Vicat) I = ISO 306, load 50 N, heating rate 50°C/h (Vicat) J = ISO 306, load 50 N, heating rate 120°C/h (Vicat) K = ASTM D1525, load 50 N, Rate A (Vicat) L = ASTM D1525, load 50 N, Rate B (Vicat)</p> <p>Three-digit number = minimum value °C</p> |
| E | <p>Electrical</p> <p>Second letter A = dielectric strength (short-time), ASTM D149 (IEC 600243) B = dielectric strength (step by step), ASTM D149 (IEC 600243)</p> <p>Three-digit number × factor of 0.1 = kV/mm, min C = insulation resistance, ASTM D257 (IEC 600093)</p> <p>Three-digit number × factor of 10¹⁴ = Ω, min D = dielectric constant at 1 MHz, ASTM D150, max (IEC 600250)</p> <p>Three-digit number × factor of 0.1 = value E = dissipation factor at 1 MHz, ASTM D150, max (IEC 600250)</p> <p>Three-digit number × factor of 0.0001 = value F = arc resistance, ASTM D495, min</p> <p>Three-digit number = value G = volume resistivity, ASTM D257 (IEC 600093)</p> <p>Three-digit number × factor of 10¹⁴ = Ω-cm, min H = comparative tracking index, ASTM D3638, ac frequency, 50 Hz, 0.1 % ammonium chloride (IEC 600112)</p> <p>Three-digit number = V, min J = volume resistivity, ASTM D257 (IEC 600093), Ω-cm K = surface resistivity, ASTM D257 (IEC 600093), Ω (per square)</p> <p>First digit indicates: 1 = minimum requirement 2 = maximum requirement</p> <p>Final two digits indicate the exponential value of the base 10 Example: EJ206 specifies a maximum volume resistivity of 10⁶Ω-cm</p> |
| F | <p>Flammability</p> <p>Second letter A = Horizontal Burning Rate Report as: ASTM D635, UL94 HB, IEC 60695-11-10, Method A (First three digits equal burn rate in mm/min), next three significant digits are thickness of sample tested in mm × factor of 0.1. If sample burns beyond the 100 mm mark, the samples are considered to have no rating.</p> <p>B = Oxygen Index Report as: ASTM D2863, ISO 4589 Value % O₂ to three significant figures</p> <p>C = Flash Ignition Report as: ASTM D1929, Procedure A Value, °C min to three significant digits rounded to nearest whole number.</p> <p>D = Self Ignition Report as: ASTM D1929, Procedure B Value, °C min to three significant digits rounded to nearest whole number.</p> <p>E = Ignition by a Small Flame ASTM D3713</p> <p>Letter retired, standard withdrawn without replacement in 2000.</p> <p>F = Vertical Burn Rating ASTM D3801, UL94 V, IEC 60695-11-10, Method B</p> |

TABLE 3 *Continued*

| Symbol | Characteristic |
|---|---|
| Report as: | (First digit = rating), next three significant digits are thickness of sample tested in mm × factor of 0.1. |
| Rating designations: | 0 = V-0 1 = V-1 2 = V-2 if no rating, do not use "F" |
| 000 = to be specified by user | |
| G = Radiant Panel Test | ASTM E162 |
| Report as: | Flame Spread |
| First two digits indicate minimum specimen thickness | |
| 00 to be specified | 05 3.00 mm |
| 01 0.25 mm | 06 6.00 mm |
| 02 0.40 mm | 07 9.00 mm |
| 03 0.80 mm | 08 12.70 mm |
| 04 1.60 mm | 09 >12.70 mm |
| Third digit indicates the flame spread | |
| 1 15 max | 5 100 max |
| 2 25 max | 6 150 max |
| 3 50 max | 7 200 max |
| 4 75 max | 8 >200 |
| H = Flame Spread Index | ASTM E84 |
| Report as: | Flame Spread Index |
| NOTE 1: | Smoke Developed Index may also be reported. |
| NOTE 2: | Classifications may be used as per the International Building Code |
| Class I: | Flame Spread 0–25 |
| Class II: | Flame Spread 26–77 |
| Class III: | Flame Spread 76–200 |
| J = Automotive Horizontal Burn Rate | ASTM D5132 , FMVSS 302, ISO 3795 |
| Report as: | (First three digits = burn rate in mm/min), next three significant digits are thickness of sample tested in mm × factor of 0.1. |
| K = | ASTM D2843 |
| Letter retired, method no longer in broad commercial use, replaced by ASTM E662 . | |
| L = | UL (IEC 60695-11-10) |
| Letter retired, see Appendix X1 for replacement procedures and references to the old requirements. | |
| M = Vertical Burn Rating; Film | ASTM D4804 , UL94 VTM , ISO 9773 |
| Report as: | (First digit = rating), next three significant digits are thickness of sample tested in mm × factor of 0.01. |
| Rating designations: | 0 = VTM0 1 = VTM1 2 = VTM2 if no rating, do not use "M" |
| N = Horizontal Burn Rate; Foam | ASTM D4986 , UL94 , ISO 9772 |
| Report as: | (First digit = rating), next three significant digits are thickness of sample tested in mm × factor of 0.1. |
| Rating designations: | 0 = HBF 1 = HF-1 2 = HF-2 if no rating, do not use "N" |
| P = Glow Wire Flammability Index | IEC 60695-2-12 |
| Report as: | (First three digits are glow wire flammability index reported in °C). Following three significant digits are thickness of sample tested in mm × factor of 0.1. |
| R = Heat Release Rate | ASTM E1354 |
| Report as: | Peak Heat Release Rate |
| Rating Designations: | (First three digits are peak heat release rate in kW/m ²), next three digits are incident heat flux in kW times ten (×10). |
| S = NBS Smoke (Flame or Smolder Mode) | ASTM E662 , ISO 5659-2 |
| Report as: | (First digit = 1 for Flame mode or 2 for Smolder mode), final three digits = Specific Optical Density. |
| T = Fire Rating | ASTM E119 |
| Report as: | (Fire resistance rating in hours, first two digits). Third digit = "1" for hose stream applied, "0" for no hose stream applied. Fourth digit is application from table below: |

TABLE 3 *Continued*

| Symbol | Characteristic |
|--------|---|
| | <p>Rating designations:</p> <p>0: No application designated 1: Bearing Walls and Partitions 2: Nonbearing Walls and Partitions 3: Columns 4: Floors and Roofs 6: Loaded Restrained Beams 7: Protective Membranes in Wall, Partition, Floor, or Roof Assemblies</p> <p>U = Large Flame Vertical Burn Rating; Plaque Report as: ASTM D5048, UL94 5VA, IEC 60695-11-20</p> <p>(First three digits = burn time plus afterglow time in seconds after fifth flame application), the fourth digit "1" or "0" for flaming drips (1 = yes, 0 = no), next three significant digits are thickness of sample tested in mm × factor of 0.1. Last digit: "1" or "0" for holes burned through plaques (1 = yes, 0 = no).</p> <p>V = Large Flame Vertical Burn Rating; Bar Report as: ASTM D5048, UL94 5VA, IEC 60695-11-20</p> <p>(First three digits = burn time plus afterglow time in seconds after fifth flame application), fourth digit "1" or "0" for flaming drips, last three significant digits are thickness of sample tested in mm × factor of 0.1.</p> |
| G | <p>Specific gravity, density, ash content</p> <p>Second letter A = ASTM D792 (tolerance ± 0.02) (ISO 1183 Method A) B = ASTM D792 (tolerance ± 0.05) (ISO 1183 Method A) C = ASTM D792 (tolerance ± 0.005) (ISO 1183 Method A) D = ASTM D1505 (tolerance ± 0.02) E = ASTM D1505 (tolerance ± 0.05) F = ASTM D1505 (tolerance ± 0.005) H = ASTM D792/D1505 (max) (ISO 1183 Method A) L = ASTM D792/D1505 (min) (ISO 1183 Method A) M = ASTM D792 (tolerance ± 0.03) (ISO 1183 Method A) N = ASTM D792 (tolerance ± 0.04) (ISO 1183 Method A) P = ASTM D792 (tolerance ± 0.07) (ISO 1183 Method A)</p> <p>Three-digit number × factor of 0.010 = requirement value</p> <p>Second letter R = ASTM D5630 (ISO 3451/1 Method A) First and second digit = filler content, % Third digit = tolerance, ± % A third digit of 0 indicates the recommended tolerance for fillers listed in Table 2.</p> |
| H | <p>Heat resistance, properties at temperature</p> <p>Second letter A = heat aged for 70 h at 100°C, ASTM D573, oven tolerance per ASTM D1349 B = heat aged for 70 h at 150°C, ASTM D573, oven tolerance per ASTM D1349 C = heat aged for 70 h at 200°C, ASTM D573, oven tolerance per ASTM D1349</p> <p>Three-digit number is obtained from Suffix Table 1. It indicates change in hardness, tensile strength, elongation and volume.</p> <p>Second letter D = tested at 100 ± 2°C E = tested at 125 ± 2°C F = tested at 150 ± 2°C</p> <p>Three-digit numbers obtained from Suffix Table 2. It indicates tensile strength, elongation, and tear strength. Example: HE565 specifies that the material has a minimum of 15 MPA tensile strength, 400 % elongation, and a tear strength of 40 kN/m when tested at 125°C.</p> <p>Second letter L = low-temperature brittleness, ASTM D2137</p> <p>Three-digit number indicates the temperature (°C) above which the material is non-brittle. Example: HL055 material is non-brittle according to ASTM D2137a, above – 55°C.</p> <p>Second letter M = heat aged for 1000 h, ASTM D573 (ISO 188), oven tolerance per D1349 First and second digit numbers indicate heat aging temperature 01 = 70°C 02 = 80°C 03 = 85°C 04 = 90°C 05 = 95°C 06 = 100°C 07 = 110°C 08 = 120°C 09 = 125°C 10 = 130 C 11 = 140°C 12 = 150°C 13 = 160°C 14 = 170°C 15 = 180°C</p> <p>Third-digit indicates retention in tensile strength, impact strength and/or elongation. 1 = 90 %, min of tensile and impact strength 2 = 90 %, min of tensile strength</p> |