



## Standard Terminology Relating to Plastic Piping Systems<sup>1</sup>

This standard is issued under the fixed designation F 412; 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 ( $\epsilon$ ) 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 terminology is a compilation of definitions of technical terms used in the plastic piping industry. Terms that are generally understood or adequately defined in other readily available sources are not included.

1.2 When a term is used in an ASTM document for which Committee F17 is responsible it is included only when judged, after review, by Subcommittee F17.91 to be a generally usable term.

1.3 Definitions that are identical to those published by other ASTM committees or other standards organizations are identified with the committee number (for example, D20) or with the abbreviation of the name of the organization (for example, IUPAC International Union of Pure and Applied Chemistry).

1.4 A definition is a single sentence with additional information included in notes.

1.5 Definitions are followed by the committee responsible for the standard(s) (for example, [F17.26]) and standard numbers(s) in which they are used (for example, F 714).

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- C 114 Test Methods for Chemical Analysis of Hydraulic Cement
- D 256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
- D 638 Test Method for Tensile Properties of Plastics
- D 648 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
- D 747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam
- D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

- D 882 Test Method for Tensile Properties of Thin Plastic Sheeting
- D 883 Terminology Relating to Plastics
- D 907 Terminology of Adhesives
- D 1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics
- D 1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- D 1488 Test Method for Amylaceous Matter in Adhesives
- D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
- D 1527 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
- D 1785 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- D 2104 Specification for Polyethylene (PE) Plastic Pipe, Schedule 40
- D 2239 Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
- D 2241 Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- D 2282 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe<sup>3</sup>
- D 2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
- D 2447 Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
- D 2513 Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
- D 2661 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings
- D 2666 Specification for Polybutylene (PB) Plastic Tubing<sup>3</sup>
- D 2680 Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
- D 2683 Specification for Socket-Type Polyethylene Fittings

<sup>1</sup> This terminology is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.91 on Editorial and Terminology.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Withdrawn. The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

- for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- D 2737 Specification for Polyethylene (PE) Plastic Tubing
- D 2751 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
- D 2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
- D 2846/D 2846M Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
- D 3035 Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- D 3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- D 3261 Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- D 3309 Specification for Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems
- D 3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
- F 402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
- F 405 Specification for Corrugated Polyethylene (PE) Pipe and Fittings
- F 441/F 441M Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
- F 442/F 442M Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)
- F 449 Practice for Subsurface Installation of Corrugated Polyethylene Pipe for Agricultural Drainage or Water Table Control
- F 628 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core
- F 645 Guide for Selection, Design, and Installation of Thermoplastic Water- Pressure Piping Systems
- F 714 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
- F 771 Specification for Polyethylene (PE) Thermoplastic High-Pressure Irrigation Pipeline Systems
- F 876 Specification for Crosslinked Polyethylene (PEX) Tubing
- F 877 Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
- F 891 Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core
- F 948 Test Method for Time-to-Failure of Plastic Piping Systems and Components Under Constant Internal Pressure With Flow
- F 1025 Guide for Selection and Use of Full-Encirclement-Type Band Clamps for Reinforcement or Repair of Punctures or Holes in Polyethylene Gas Pressure Pipe
- F 1335 Specification for Pressure-Rated Composite Pipe and Fittings for Elevated Temperature Service
- F 1473 Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
- F 1488 Specification for Coextruded Composite Pipe
- F 1499 Specification for Coextruded Composite Drain, Waste, and Vent Pipe (DWV)
- F 1668 Guide for Construction Procedures for Buried Plastic Pipe
- F 1733 Specification for Butt Heat Fusion Polyamide(PA) Plastic Fitting for Polyamide(PA) Plastic Pipe and Tubing
- F 1760 Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
- F 1924 Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing
- F 1948 Specification for Metallic Mechanical Fittings for Use on Outside Diameter Controlled Thermoplastic Gas Distribution Pipe and Tubing
- F 1970 Specification for Special Engineered Fittings, Apertures or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems
- F 1973 Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems
- F 1986 Specification for Multilayer Pipe Type 2, Compression Fittings, and Compression Joints for Hot and Cold Drinking-Water Systems
- F 1987 Specification for Multilayer Pipe Type 2, Compression Fittings, and Compression Joints for Hydronic Heating Systems
- F 2145 Specification for Polyamide 11 (PA 11) and Polyamide 12 (PA12) Mechanical Fittings for Use on Outside Diameter Controlled Polyamide 11 and Polyamide 12 Pipe and Tubing
- F 2158 Specification for Residential Central-Vacuum Tube and Fittings
- F 2160 Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)
- F 2176 Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct
- 2.2 *ISO Standards:*<sup>4</sup>
- ISO 3 Preferred Numbers
- ISO 497 Preferred Numbers
- ISO R 161 Pipes of Plastics Materials for the Transport of Fluids (Outside Diameters and Nominal Pressures) Part I, Metric Series
- ISO TR 9080 Thermoplastics Pipes for the Transport of Fluids-Methods of Extrapolation of Hydrostatic Stress Rupture Data to Determine the Long-Term Hydrostatic Strength of Thermoplastic Pipe Materials
- 2.3 *ANSI Standard:*<sup>4</sup>

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

## Z17.1 ANSI Preferred Numbers

### 2.4 PPI Standard:<sup>5</sup>

PPI TR-4

## 3. Terminology

**acceptance testing**—testing performed on a product to determine whether or not an individual lot of the product conforms with specified requirements. [F17]

DISCUSSION—The number of requirements are usually fewer than for **qualification testing** (see definition).

**acetal plastics, n**—highly crystalline linear thermoplastic homopolymers or copolymers characterized by repeating oxymethylene units. [F17]

**acrylonitrile-butadiene-styrene (ABS) pipe and fitting plastics**—plastics containing polymers or blends of polymers, or both, in which the minimum butadiene content is 6%, the minimum acrylonitrile content is 15%, the minimum styrene or substituted styrene content, or both, is 15%, and the maximum content of all other monomers is not more than 5%; plus lubricants, stabilizers, and colorants. [F17.61] D 1527, D 2282 [17.62] D 2680, D 2751

**adhesive**—a substance capable of holding materials together by surface attachment. [F17]

**adhesive bonded joint**—see **joint, adhesive bonded**.

**adhesive, solvent**—see **solvent cement**.

**adiabatic extrusion**—a method of extrusion in which, after the extrusion apparatus has been heated sufficiently by conventional means to plastify the material, the extrusion process can be continued with the sole source of heat being the conversion of the drive energy, through viscous resistance of the plastic mass in the extruder. [D20] D 883

**aging, n**—(1) the effect on materials of exposure to an environment for an interval of time.

(2) the process of exposing materials to an environment for an interval of time. [D20] D 883

**alloy, n**—*in plastics*, two or more immiscible polymers united, usually by another component, to form a plastic resin having enhanced performance properties. [D20] D 883

**antioxidant, n**—compounding ingredient used to retard deterioration caused by oxidation. [F17]

**apparent density**—the weight per unit volume of a material including voids inherent in the material as tested. [F17]

DISCUSSION—The term bulk density is commonly used for material such as molding powder.

**approving authority**—the individual official, board, department, or agency established and authorized by a state, county, city, or other political subdivision, created by law to administer and enforce specified requirements.

**artificial weathering**—exposure to laboratory conditions, which may be cyclic, involving temperature, relative humidity, radiant energy, or any other conditions or pollutants found in the atmosphere in various geographical areas; or both. [F17]

DISCUSSION—The interlaboratory exposure conditions are usually intensified beyond those encountered in actual outdoor exposure in an attempt to achieve an accelerated effect.

**backfill**—all material used to fill the trench from bedding to finished surface. [F17.65] F 449, F 1668

**backfill, final**—material used to fill the trench from initial backfill to finished surface. [F17]

**backfill, initial**—material used to fill the trench from top of bedding to a designated height over the pipe. [F17]

**backfill, pipe zone**—see **pipe zone backfill**.

**backfill, unconsolidated**—noncompacted material in place in trench. [F17]

**beam loading**—the application of a load to a pipe between two points of support, usually expressed in newtons (or pounds-force) and the distance between the centers of the supports. [F17]

**bedding, n**—materials placed in the bottom of the trench on top of the foundation soil which provides stable bottom support for buried pipe including the trench bottom groove support angle or select material placed around the pipe, and envelope or filter materials where used during insulation. [F17.65] F 449, F 1668

**bedding, v**—placement of support materials for buried pipe. [F17]

**bell-and-spigot joint**—see **joint, bell-and-spigot gasket**.

**bell end**—the enlarged portion of a pipe that resembles the socket portion of a fitting and that is intended to be used to make a joint. [F17]

**bend**—a fitting either molded separately or formed from pipe for the purpose of accommodating a directional change. [F17]

DISCUSSION—Also called *ell*, *elbow*, or *sweep*. Bends generally imply fittings of relatively shorter radii than sweeps.

**beveled pipe**—a pipe with an end chamfered to mate or adjust to another surface or to assist in assembly. [F17]

**binder, n**—in a reinforced plastic, the continuous phase which holds together the reinforcement. [D20] D 883

DISCUSSION—During fabrication, the binder, which may be either thermoplastic or thermoset, usually undergoes a change in state.

**blinding**—the placement of soil, bedding material over and on the sides of the pipe, tubing or envelope to ensure proper grade, alignment, support, and protection of pipe during backfilling and after installation. [F17.65] F 449

**blister, n**—an imperfection, a rounded elevation of the surface of a plastic, with boundaries that may be more or less sharply defined, somewhat resembling in shape a blister on the human skin. [D20] D 883

**bloom, n**—a visible exudation or efflorescence on the surface of a material. [D20] D 883

**blow molding**—a method of fabrication in which a heated parison (hollow tube) is forced into the shape of a mold cavity by internal gas pressure. [D20] D 883

**blowing agent**—a compounding ingredient used to produce gas by chemical or thermal action, or both, in manufacture of hollow or cellular articles. [D20] D 883

<sup>5</sup> Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.

**brittle failure**—a pipe failure mode which exhibits no visible (to the naked eye) permanent material deformation (stretching, elongation, or necking down) in the area of the break.

[F17.40] F 1473

**building drain**—that part of the lowest horizontal piping of a drainage system that receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer beyond the foundation walls of the building or structure. [F17]

DISCUSSION—The building sewer generally begins 2 to 5 ft beyond the foundation walls.

**building drain (sanitary)**—a building drain that conveys gray water or sewage, or both. [F17]

**building drain (storm)**—a building drain that conveys storm water only. [F17]

**building sanitary sewer**—that part of the horizontal piping of a sanitary drainage system which extends from the building sanitary drain, receives the discharge of the building sanitary drain, and conveys it to a public sewer, private sewer, individual sewage disposal system, or other point of disposal. [F17]

**building storm sewer**—that part of the horizontal piping of a storm drainage system which extends from the building storm drain, receives the discharge of the building storm drain, and conveys it to a public storm sewer, private storm sewer, or other point of disposal. [F17]

*building supply*—See **water service**.

**bulk factor, *n***—the ratio of the volume of a given mass of molding material to its volume in the molded form. ISO/[D20] D 883

DISCUSSION—The bulk factor is also equal to the ratio of the density of the material to its apparent density in the unmolded form.

**burst strength**—the internal pressure required to cause a pipe or fitting to fail. [F17]

DISCUSSION—This pressure will vary with the rate of buildup of the pressure and the time during which the pressure is held.

*butt-fused joint*—see **joint, butt-fused**.

**butylene plastics**—plastics based on resins made by the polymerization of butene or copolymerization of butene with one or more unsaturated compounds, the butene being in greatest amount by weight. [D20] D 883

**cell, *n***—a small cavity surrounded partially or completely by walls. [D20] D 883

**cell, closed**—a cell totally enclosed by its walls and hence not interconnecting with other cells. (See also **cell** and **cell, open**.) ISO/[D20] D 883

**cell, open**—a cell not totally enclosed by its walls and hence interconnecting with other cells. (See also **cell** and **cell, closed**.) [D20] D 883

**cellular plastic**—a plastic containing numerous cells, intentionally introduced, interconnecting or not, distributed throughout the mass. [D20] D 883 [17.63] F 628 [17.25] F 891

**cellulose acetate butyrate (CAB) plastics**—plastic made by compounding a cellulose acetate butyrate ester with plasticizers and other ingredients. Cellulose acetate butyrate ester

is a derivative of cellulose (obtained from cotton or wool pulp, or both) made by converting some of the hydroxyl groups in cellulose to acetate and butyrate groups with chemicals. [F17]

**central vacuum tubing, *n***—plastic tubing used for residential central vacuum systems in which outside diameter is controlled and where the wall thickness is usually small when compared to the diameter. [F17.25] F 2158

**chalking, *n***—in *plastics*, a powdery residue on the surface of a material resulting from degradation or migration of an ingredient, or both. [D20] D 883

DISCUSSION—Chalking may be a designed-in characteristic.

*chemical cleaner*—see **cleaner, chemical**.

**chemical resistance**—the ability to resist chemical attack. [F17]

DISCUSSION—The attack is dependent on the method of test and its severity is measured by determining the changes in physical properties. Time, temperature, stress, and reagent may all be factors that affect the chemical resistance of a material.

**chemically formed polymeric material**—a cellular material in which the cells are formed by gases generated from thermal decomposition or other chemical reaction. [D20] D 883

**chlorinated poly(vinyl chloride) plastics**—plastics based on chlorinated poly(vinyl chloride) in which the chlorinated poly(vinyl chloride) is in the greatest amount by weight. [D20] D 883

**chlorofluorocarbon plastics**—plastics based on polymers made with monomers composed of chlorine, fluorine, and carbon only. ISO/[D20] D 883

**chlorofluorohydrocarbon plastics, *n***—plastics based on polymers made with monomers composed of chlorine, fluorine, hydrogen, and carbon only. ISO/[D20] D 883

**cleaner, chemical**—an organic solvent used to remove foreign matter from the surface of plastic pipe and fittings. [F17.20] F 402

DISCUSSION—Cleaners have essentially no effect on the plastic surface being cleaned and may be used prior to joining with a solvent cement or adhesive.

**cleaner, mechanical**—an abrasive material or device used to remove foreign matter and gloss from the surface of plastic pipe and fittings. [F17]

DISCUSSION—Mechanical cleaners may be used prior to joining with a solvent cement or adhesive.

**closed-cell cellular plastics**—cellular plastics in which almost all the cells are noninterconnecting. [D20] D 883 [F17.63] F 628

*closed-cell foamed plastics*—See **closed-cell cellular plastics**.

**code**—(1) a system of symbols, letters or numbers, used to convey a message requiring brevity; (2) a set of rules established by a legal or quasi-legal body. [F17]

**code, classification**—a code that identifies a plastic material by its properties in accordance with the pertinent ASTM specification. [F17]

**code, manufacturer's**—a code that provides manufacturing identity for a piping product. [F17]

**code, thermoplastic pipe materials designation**— letters and ciphers for the designation of stress-rated thermoplastic compound, which consists of two or three letters to indicate the abbreviation as listed in Terminology D 1600, for the type of thermoplastic resin—followed by four Arabic numerals—two to describe the short-term properties, in accordance with the ASTM standard being referenced, and two to designate the hydrostatic design stress when tested in water at 73°F (23°C) in units of 100 psi, with any decimal figures dropped. [F17]

DISCUSSION—In some ASTM standards, the short-term properties with more than two numbers have a table provided to convert to two numbers to be used in the code.

DISCUSSION—When the hydrostatic design stress code is less than two numbers, a zero is inserted before the number.

DISCUSSION—For polyethylene compound, the short-term properties are described using two Arabic numerals in accordance with Specification D 3350, specifically, the cell classification number value for density followed by the cell classification number value for slow crack growth resistance.

**coextrusion**—a process whereby two or more heated or unheated plastic material streams forced through one or more shaping orifice(s) become one continuously formed piece. [F17.63] D 2661, F 628 [F17.25] F 891, F 1760 [F17.11] F 1488

*cold flow*—See **creep**.

**cold molding**—a special process of compression molding in which the molding is formed at room temperature and subsequently baked at elevated temperatures. [D20] D 883

**collapse, n**—(1) inadvertent densification of cellular material during manufacture resulting from breakdown of cell structure; (2) the buckling of the inner liner of composite piping; (3) the buckling or flattening of a plastic rehabilitation liner; (4) the buckling or crushing of a plastic pipe from external forces, such as earth loads or external hydrostatic load. [F17]

**compaction, soil**—act of packing soil with mechanical force to increase its density. [F17]

**compatible**—(1) a condition wherein components of a plastic piping system or different specific plastic materials, or both, can be joined together for satisfactory joints. (2) in relation to elastomeric seal joints, a condition wherein the elastomer does not adversely affect the pertinent properties of the plastic pipe or fittings, or both, when the sealing gasket is in intimate contact with the plastic for a prolonged period. [F17]

**composite pipe**—pipe consisting of two or more different materials arranged with specific functional purpose to serve as pipe. [F17]

**compound, n**—a mixture of a polymer with other ingredients such as fillers, stabilizers, catalysts, processing aids, lubricants, modifiers, pigments, or curing agents. [F17.11] F 1488, F 1499

*compression fitting joint*—see **joint, compression fitting**.

*compression gasket joint*—see **joint, compression gasket**.

**compression molding**—the method of molding a material already in a confined cavity by applying pressure and usually heat. [D20] D 883

**conduit, (duct), n**—a tubular raceway for carrying electric

wires, cables, or other conductors. [F17.10] F 2176 [F17.26] F 2160

**consolidation**—reduction in volume of soil as a result of gravitational forces. [F17]

**contamination**—the presence of a substance not intentionally incorporated in a product. [F17]

**continuous waste**—a drain connecting two or more plumbing fixtures or components of plumbing fixtures to a common trap. [F17]

**crack**—any narrow opening or fissure in the surface that is visible to the naked eye. [F17.65] F 405

**crater, n**—a small, shallow surface imperfection. [D20] D 883

**crazing, n**—apparent fine cracks at or under the surface of a plastic. [D20] D 883

DISCUSSION—The crazed areas are composed of polymeric material of lower density than the surrounding matrix.

**creep, n**—the time-dependent part of strain resulting from stress, that is dimensional change caused by the application of load over and above the elastic deformation and with respect to time. [D20] D 883, [17.60] F 1025

**cross laminate**—a laminate in which some of the layers of material are oriented approximately at right angles to the remaining layers with respect to the grain or strongest direction in tension. (See also **parallel laminate**.) [D20] D 883

**crosslinking, n**—the formation of a three dimensional polymer by means of interchain reactions resulting in changes in physical properties. [D20] D 883

**cure, v**—to change the properties of a polymeric system into a more stable, usable condition by the use of heat, radiation, or reaction with chemical additives. ISO/[D20] D 883

DISCUSSION—Cure may be accomplished, for example, by removal of solvent or by crosslinking.

**deadload**—the static load imposed on the top of the pipe. [F17]

**deflection temperature**—the temperature at which a specimen will deflect a given distance at a given load under prescribed conditions of test. (See Test Method D 648.) Formerly called heat distortion. [F17]

**degradation, n**—a deleterious change in chemical structure, physical properties, or appearance of a plastic. [D20] D 883

**density, apparent**—see **apparent density**.

**density of plastics**—the weight per unit volume of material at 23°C expressed as D23c, g/cm<sup>3</sup>(kg/m<sup>3</sup>). [F17]

DISCUSSION—Taken from Test Method D 1505.

**depth, n**—in the case of a beam, the dimension parallel to the direction in which the load is applied. [D20] D 883

**diffusion**—the movement of a material such as a gas or liquid, in the body of a plastic. [F17]

DISCUSSION—If the gas or liquid is absorbed on one side of a piece of plastic and given off on the other side, the phenomenon is called permeability. Diffusion and permeability are not due to holes or pores in the plastic.

**dimension ratio (DR)**—the average specified diameter of a

pipe or tubing divided by the minimum specified wall thickness. The DR values shall be rounded to the nearest 0.5 unless otherwise specified. [F17.10] D 2683, D 3261, F 1733 [17.11] D 1488 [F17.26] D 2737, [F17.60] D 2513

DISCUSSION—Each pipe can have two dimension ratios depending on whether the outside or inside diameter is used. In practice, the outside diameter is used if the standards requirement and manufacturing control are based on this diameter. The inside diameter is used when this measurement is the controlling one.

**dry-blend, n**—dry compound prepared without fluxing or addition of solvent (also called powder blend). [D20] D 883

**ductile failure**—a pipe failure mode which exhibits material deformation (stretching, elongation, or necking down) in the area of the break. [F17]

**elastomer, n**—a macromolecular material that at room temperature returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and release of the stress. [D20] D 883

**elastomeric seal**—a material or device that uses an elastomer to effect a seal between separable piping components. [F17]

**elevated temperature testing**—tests on plastic pipe above 23°C (73°F). [F17]

**embedment**—the placement of materials completely around the pipe to provide support. [F17.62] F 1668

**encasement, n**—see **incasement, n**.

**encasement, v**—see **incasement, v**.

**engineering plastics, n**—those plastics and polymeric compositions for which well-defined properties are available, such that engineering rather than empirical methods can be used for design and manufacture of products requiring definite and predictable performance in structural applications over a substantial temperature range. [D20] D 883

**envelope, drainage**—the materials completely surrounding a pipe to provide support or protection or act as a filter. [F17]

**environmental stress cracking**—the development of cracks in a material that is subjected to stress or strain in the presence of specific chemicals. [F17]

**ethylene plastics, n**—plastics based on polymers of ethylene or copolymers of ethylene with other monomers, the ethylene being in greatest amount by mass. ISO/[D20] D 883

**exfiltration, pipe**—the passage of fluid from a pipe section through small holes or leaks. [F17]

**expandable plastic, n**—a plastic in a form capable of being made cellular by thermal, chemical, or mechanical means. [D20] D 883

*expanded plastics*—See **cellular plastics**.

**extrusion, n**—a process in which heated or unheated plastic is forced through a shaping orifice (a die) in one continuously formed shape as film, sheet, rod, or tubing. [D20] D 883

**extrusion, adiabatic**—see **adiabatic extrusion**.

**fabricating, n**—the manufacture of plastic products from molded parts, rods, tubes, sheeting, extrusions, or other forms by appropriate operations such as punching, cutting, drilling, and tapping including fastening plastic parts together or to other parts by mechanical devices, adhesives,

heat sealing, or other means. [D20] D 883

**failure, adhesive**—rupture of an adhesive bond, such that the plane of separation appears to be at the adhesive-adhering interface. [F17]

**failure, brittle**—see **brittle failure**

**failure, ductile**—see **ductile failure**

**failure, slit**—see **silt failure**

**filler, n**—a relatively inert material added to a plastic to modify its strength, permanence, working properties, or other qualities or to lower costs. (See also **reinforced plastic**.) [D20] D 883

**fish-eye, n**—small globular mass that has not blended completely into the surrounding material. [D20] D 883

**fitting, n**—a piping component used to join or terminate sections of pipe or to provide changes of direction or branching in a pipe system. [F17]

*flanged joint*—see **joint, flanged**.

*flare joint*—see **joint, flare**.

**flow rate**—rate of extrusion, weight per unit of time, g/10 min (kg/s), of molten resins through a die of specified length and diameter, under prescribed conditions of temperature, load, and piston position in the barrel as the timed measurement is being made. [F17]

**fluorocarbon plastic, n**—a plastic based on polymers made with perfluoromonomers. ISO/[D20] D 883

DISCUSSION—When the monomer is essentially tetrafluoroethylene, the prefix TFE is sometimes used to designate these materials. It is preferable to use the accepted abbreviation, PFTE. TFE should not be used by itself to mean PTFE. When the resins are copolymers of tetrafluoroethylene and hexafluoropropylene, the resins may be designated with the prefix FEP. Other prefixes may be adopted to designate other fluorocarbon plastics.

**fluorohydrocarbon plastics, n**—plastics based on polymers made with monomers composed of fluorine, hydrogen, and carbon only. ISO/[D20] D 883

**fluoroplastic, n**—a plastic based on polymers made from monomers containing one or more atoms of fluorine, or copolymers of such monomers with other monomers, the fluorine-containing monomer(s) being in the greatest amount by mass. [D20] D 883

DISCUSSION—For specific examples of fluoroplastic see **fluorocarbon plastic, chlorofluorocarbon plastics, fluorohydrocarbon plastics, and chlorofluorohydrocarbon plastic**.

*foamed plastics, n*—See **cellular plastics** (the preferred terminology).

**forming, n**—a process in which the shape of plastic pieces such as sheets, rods, or tubes is changed to a desired configuration. [D20] D 883

DISCUSSION—The use of the term “forming” in plastics technology does not include such operations as molding, casting, or extrusion, in which shapes or pieces are made from molding materials or liquids.

**frosting, n**—a light-scattering surface resembling fine crystals. See also **chalking, haze, bloom**. [F17]

**fungi resistance**—the ability of plastic pipe to withstand fungi growth or their metabolic products, or both, under normal conditions of service or laboratory tests simulating such conditions. [F17]

**fuse**, *v*—(1) to convert plastic powder or pellets into a homogeneous mass through heat and pressure; (2) to make a plastic piping joint by heat and pressure. [F17]

**gasket joint**—see **joint**, **compression gasket** and **joint**, **bell-and-spigot gasket**.

**gate**, *n*—in an injection mold, a constriction in the flow channel between the runner and the mold cavity. [D20] D 883

**gel**, *n*—(1) a semisolid system consisting of a network of solid aggregates in which liquid is held; (2) the initial jelly-like solid phase that develops during the formation of a resin from a liquid; (3) with respect to vinyl plastisols, gel is a state between liquid and solid that occurs in the initial stages of heating, or upon prolonged storage. [D20] D 883

DISCUSSION—All three types of gel have very low strengths and do not flow like a liquid. They are soft, flexible, and may rupture under their own weight unless supported externally.

**gel point**—the stage at which a liquid begins to exhibit pseudo-elastic properties. [D20] D 883

DISCUSSION—This stage may be conveniently observed from the inflection point on a viscosity-time plot. (See **gel** (2).)

**gel time**, *n*—the period of time from the initial mixing of the reactants of a liquid material composition to the time when gelation occurs, as defined by a specific test method. [D20] D 883

DISCUSSION—For a material that must be processed by exposure to some form of energy, the zero time is the start of exposure.

**glass transition**—the reversible change in an amorphous polymer or in amorphous regions of a partially crystalline polymer from (or to) a viscous or rubbery condition to (or from) a hard and relatively brittle one. [D20] D 883

DISCUSSION—The glass transition generally occurs over a relatively narrow temperature region and is similar to the solidification of a liquid to a glassy state; it is not a phase transition. Not only do hardness and brittleness undergo rapid changes in this temperature region but other properties, such as thermal expansibility and specific heat also change rapidly. This phenomenon has been called second order transition, rubber transition, and rubbery transition. The word transformation has also been used instead of transition. Where more than one amorphous transition occurs in a polymer, the one associated with segmental motions of the polymer backbone chain or accompanied by the largest change in properties is usually considered to be the glass transition.

**glass transition temperature (T<sub>g</sub>)**—the approximate midpoint of the temperature range over which the glass transition takes place. [D20] D 883

DISCUSSION—The glass transition temperature can be determined readily only by observing the temperature at which a significant change takes place in a specific electrical, mechanical, or other physical property. Moreover, the observed temperature can vary significantly depending on the specific property chosen for observation and on details of the experimental technique (for example, rate of heating, frequency). Therefore, the observed T<sub>g</sub> should be considered only an estimate. The most reliable estimates are normally obtained from the loss peak observed in dynamic mechanical tests or from dilatometric data.

**graft copolymer**—a copolymer in which polymeric side chains have been attached to the main chain of a polymer of

different structure.

[D20] D 883

**gravity flow**, *n*—liquefied medium conveyance that is induced by a positive elevation head such as a downward pipeline slope or a higher elevation reservoir. [F17]

**gravity flow, non-pressure**, *n*—gravity flow of liquefied medium in a piping system that is not pressure-rated and where flow is regularly less than full (open channel flow) except during conditions when the system may become temporarily surcharged in which case, the system is subject to temporary internal hydrostatic pressure that is generally limited to piping system joint capabilities.[F17]

**gravity flow, pressure**, *n*—gravity flow of liquefied medium in a pressure-rated piping system where flow regularly fills the piping system (closed channel flow) and subjects the piping system to internal hydrostatic pressure that is within the capabilities of pressure-rated piping system components and joints. [F17]

**gray water**—the waste water of a system that may be a combination of the liquid and water-carried wastes except human wastes. [F17]

**groove angle**—the angle of support for a pipe when a formed groove is made in bedding or foundation. [F17]

**gusset**, *n*—(1) a piece used to give additional size or strength in a particular location of an object.

(2) the folded-in portion of flattened tubular film. [D20] D 883

**haunching**—the act of placing bedding material around the haunch of the pipe. [F17]

**haunch**—that portion of the pipe barrel extending from bottom to springline. [F17]

**haze**—the cloudy or turbid aspect or appearance of an otherwise transparent specimen caused by light scattered from within the specimen or from its surfaces. [D20] D 883

DISCUSSION—For the purpose of Test Method D 1003, haze is the percentage of transmitted light which, in passing through the specimen, deviates from the incident beam through forward scatter more than 2.5° on the average.

**heat-fused joint**—see **joint**, **heat-fused**.

**heat joining**—making a joint by heating the mating surfaces of the pipe components to be joined and pressing them together so that they fuse and become essentially one piece. [F17]

DISCUSSION—Also known as heat fusion, thermal fusion, and fusion.

**heat mark**—extremely shallow depression or groove in the surface of a plastic visible because of a sharply defined rim or a roughened surface. (See also **sink-mark**.) [D20] D 883

**high-density polyethylene plastics (HDPE)**, *n*—those linear polyethylene plastics, g.v., having a standard density of 0.941 g/cm<sup>3</sup> or greater. [D20] D 883

**homopolymer**, *n*—a polymer resulting from polymerization involving a single monomer. [D20] D 883

**hoop stress**—the tensile stress in the wall of the piping product in the circumferential direction due to internal hydrostatic pressure. [F17.48] D 2837, F 948

DISCUSSION—Hydrostatic means fluid and is not limited to water. Units will be reported as pounds per square inch (psi) or mega pascals (Mpa). Hoop stress is calculated by using ISO equation. Hoop stress

should only be determined on straight hollow cylindrical specimens. Products of more complex shape may be evaluated by Option 2 of Appendix X1 of F 948 based on pressure.

**hydrostatic design basis**—one of a series of established stress values specified in Test Method D 2837 for a plastic compound obtained by categorizing the long-term hydrostatic strength determined in accordance with Test Method D 2837. [F17.48] D 2837

**hydrostatic design stress (HDS)**—the estimated maximum tensile stress the material is capable of withstanding continuously with a high degree of certainty that failure of the pipe will not occur. This stress is circumferential when internal hydrostatic water pressure is applied. [D20.23] D 2104 [F17.25] D 1785, D 2241, F 442/F 442M [F17.26] D 2239, D 2447, D 2666, D 2737, D 3035, F 441/F 441M, F 876, [F17.40] D 2837 [F17.61] D 2282, F 771, D 1527

**impact, Izod**—a specific type of impact test made with a pendulum-type machine on a cantilever beam specimen and also the values obtained by this method. [F17]

DISCUSSION—See Test Methods D 256.

**impact, tup**—a falling weight (tup) impact test developed specifically for pipe and fittings. [F17]

DISCUSSION—There are several variables that can be selected. (See Test Method D 2444.)

**incasement, n**—a rigid structure or pipe surrounding a buried pipe to provide additional support or protection. [F17]

**incasement, v**—placement of a rigid structure or pipe surrounding a buried pipe to provide additional support or protection. [F17]

**infiltration, pipe**—the passage of fluid into a pipe section through small holes or leaks. [F17]

**inhibitor, n**—a substance used in low concentration which suppresses a chemical reaction. [D20] D 883

DISCUSSION—Inhibitors, unlike catalysts, are consumed during the reaction.

**injection molding, n**—the process of forming a material by forcing it, in a fluid state and under pressure, through a runner system (sprue, runner, gate(s)) into the cavity of a closed mold. [D20] D 883

**insert, n**—a part consisting of metal or other material which may be molded into position or may be pressed into the molding after the completion of the molding operation. ISO [D20] D 883

**insert-fitting joint**—see **joint, clamped insert-fitting**.

**ISO equation**—an equation showing the interrelations between stress, pressure and dimensions in pipe, namely:

$$\frac{S = P (ID + t)}{2t} \text{ for inside diameter controlled pipe}$$

or

$$\frac{S = P (OD - t)}{2t} \text{ for outside diameter controlled pipe}$$

where:

S = hoop stress,

P = pressure,  
ID = average inside diameter,  
OD = average outside diameter, and  
t = minimum wall thickness.

(See ISO R 161.) [F17.25] D 1785, F 441/F 441M, F 442/F 442M [F17.26] D 2104, D 2239, D 2447, D 2666, D 2737, D 3035, F 714, F 876 [F17.61] D 1527, D 2282, D 2846/D 2846M, D 3309, F 645, F 771, F 877

**isotactic, adj**—pertaining to a type of polymeric molecular structure containing a sequence of regularly spaced asymmetric atoms arranged in like configuration in a polymer chain. [D20] D 883

**joint**—the location at which two pieces of pipe or a pipe and a fitting are connected together. [F17.10] F 2145 [F17.60] F 1924, F 1948, F 1973

DISCUSSION—The joint may be made by an adhesive, a solvent-cement, heat joining, or a mechanical device such as threads or a ring seal.

**joint, adhesive-bonded**—a joint made using an adhesive to bond the piping components. [F17]

**joint, bell and spigot gasket**—a connection between piping components consisting of a bell end on one component, an elastomeric gasket between the components, and a spigot end on the other component. See *joint, push on*. [F17]

**joint, butt-fused**—a joint in which the prepared ends of the joint components are heated and then placed in contact to form the joint. (See Fig. 1.) [F17]

**joint, compression**—a mechanical joint made by deforming a sealing member to form a pressure seal between the fitting or pipe bell and the pipe or tube (See Fig. 2). [F17]

DISCUSSION—Compression joints include, but are not limited to, insert fitting joints, compression gasket joints and flare joints.

**joint, compression gasket**—a mechanical joint that utilizes a compression nut or a gland nut against a gasket to develop a

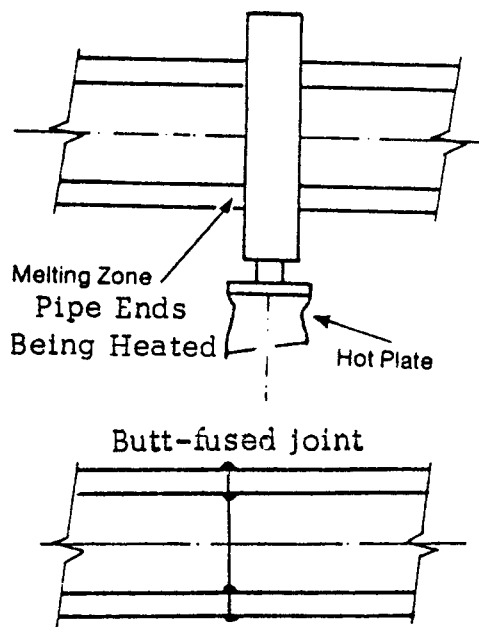


FIG. 1 Butt Fusion



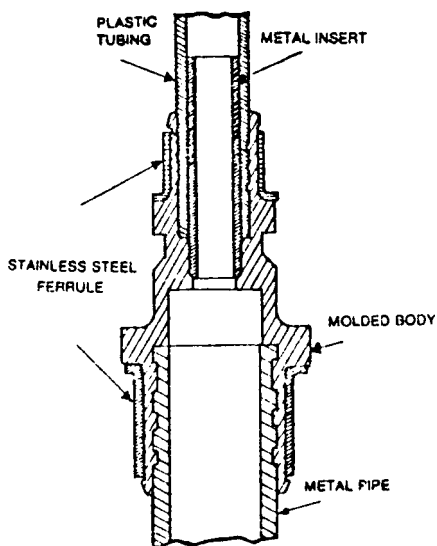


FIG. 2 Compression Fitting

pressure seal.

[F17]

DISCUSSION—There are currently available various designs of compression gasket joints in fittings, transition fittings, and couplings.

**joint, flanged**—a mechanical joint using pipe flanges, a gasket, and bolts.

[F17]

DISCUSSION—The flanges are normally fastened to the pipe or fittings but there are some systems in which the flanges are free to rotate.

**joint, flare**—a mechanical compression connection between flared-end plastic pipe and a fitting specifically designed to accept flared-end plastic pipe. (See Fig. 3.)

[F17]

DISCUSSION—A special tool is used to flare plastic pipe.

**joint, heat-fused**—a joint made using heat and pressure only.

[F17]

DISCUSSION—The surfaces are heated with special tools until the surfaces have softened. When engaged, the softened surfaces flow together forming a joint as the material cools. There are three basic types of heat-fused joints: butt fused, socket or insert fused, and saddle fused.

**joint, insert-fitting**—a mechanical joint using external metal clamps, rings, or other devices to form a pressure seal between an insert fitting and the pipe or tube.

[F17]

DISCUSSION—These joints are a type of compression joint.

**joint, mechanical**—a connection between piping components employing physical force to develop a seal or produce alignment.

[F17]

DISCUSSION—Mechanical joints may or may not carry thrust forces across the joint. (Examples of mechanical joints include, but are not

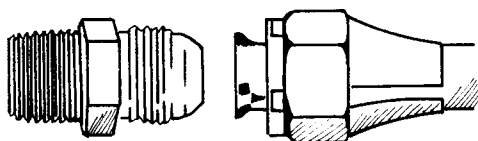


FIG. 3 Flare Joint

limited to threaded joint, compression gasket joint, compression fitting joint, push-on joint, clamped insert fitting joint, flanged joint, or flare joint.)

**joint, push on**—a joint in which a continuous elastomeric ring gasket is compressed into annular space formed by the pipe or fitting socket and the spigot end of the pipe, and forms a positive seal after being assembled. Details of the joint design and assembly shall be in accordance with the manufacturer's instructions.

[F17.20] D 3139

DISCUSSION—Sometimes called a bell-and-spigot gasket joint.

**joint, saddle-fused**—a joint in which the curved base of the saddle fitting and a corresponding area of the pipe surface are heated and then placed together to form the joint.

[F17]

**joint, socket-fused or insert-fused**—a joint in which the joining surfaces of the components are heated, and the joint is made by inserting one component into the other. (See Fig. 4 and Fig. 5.)

[F17]

**joint, solvent cement**—see **solvent cement joint**.

**joint, solvent-cemented**—a joint made using a solvent cement to unite the components.

[F17]

DISCUSSION—The solvent cement softens the surfaces of the components, which then solidify as the solvent evaporates.

**joint, solvent**—see **solvent joint**.

**joint, threaded**—a mechanical joint that utilizes threaded pipe and fittings.

[F17]

DISCUSSION—There are many types of threads, and the same thread configuration must be used for mating components.

**knit-line**—see **weld-line** (preferred terminology).

**laminate, n**—a product made by bonding together two or more

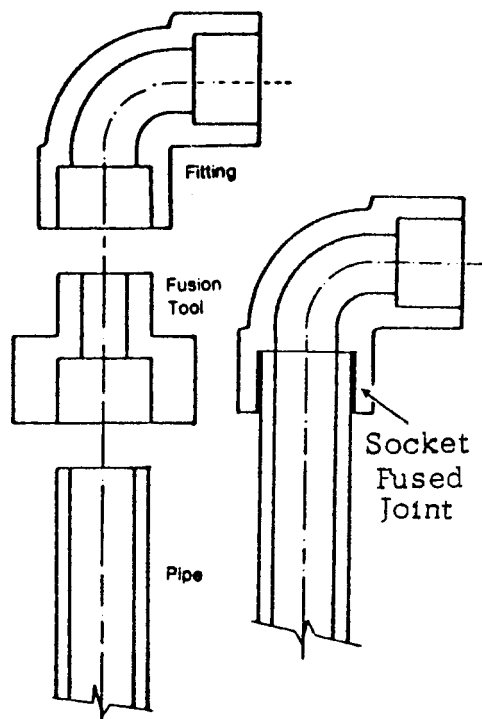


FIG. 4 Socket Fusion

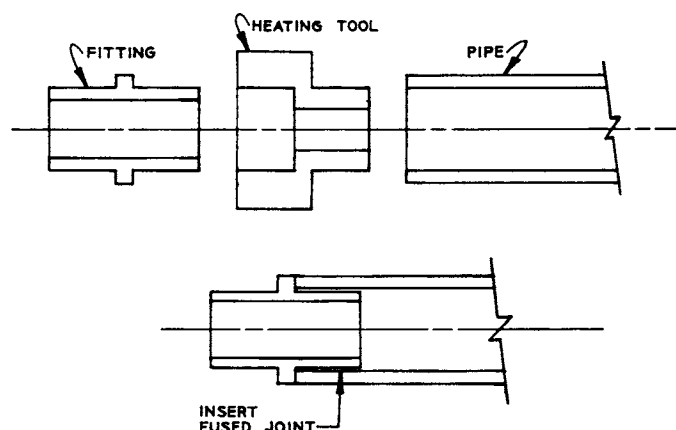


FIG. 5 Insert Fusion

layers of material or materials. (See also **cross laminate** and **parallel laminate**.) [D20] D 883

DISCUSSION—A single resin-impregnated sheet of paper, fabric, or glass mat, for example, is not considered a laminate. Such a single-sheet construction may be called a “lamina.” (See also **reinforced plastic**.)

**laminate, cross**—see **cross laminate**.

**laminate, parallel**—see **parallel laminate**.

**laying length**—the centerline length of an installed pipeline system, section, or fitting. [F17]

DISCUSSION—Laying length of pipe or fitting with overlapping joining elements, for example, spigot and socket, include the entire length reduced by the portion of the spigot that is overlapped. Laying length of pipe or fitting with a spigot on each end is the overall length of the uninstalled section.

**live load**—portion of load transmitted to the pipe from wheel or traveling loads or other surcharged load. [F17]

**long-term hydrostatic strength (LTHS)**—the hoop stress that when applied continuously will cause failure of the pipe at 100 000 h (11.43 years). [F17.40] D 2837

DISCUSSION—These strengths are usually obtained by extrapolation of log-log regression equations or plots. Typical conditions are water at 23°C.

**lot, n**—a lot shall consist of all pipe and fittings or appurtenances of the same size produced from one extrusion line or molding machine during one designated period. [F17.10]

F 1970 [F17.11] F 1335, F 1488, F 1986, F 1987 [F17.25] F 891 [F17.63] D 2661, F 628, F 1499

**low-density polyethylene plastics (LDPE), n**—those branched polyethylene plastics, q.v., having a standard density of 0.910 to 0.925 g/cm<sup>3</sup>. [D20] D 883

**lubricant, n**—(1) a material used to reduce the friction between two mating surfaces that are being joined by sliding contact. (2) an additive that is added to a plastic compound to lower the viscosity or otherwise improve the processing or product characteristics. [F17]

**mechanical cleaner**—see **cleaner, mechanical**.

**mechanical joint**—see **joint, mechanical**.

**medium density polyethylene plastics (MDPE), n**—those branched polyethylene plastics, q.v., having a standard density of 0.926 to 0.940 g/cm<sup>3</sup>. [D20] D 883

**melt index**—the flow rate of PE material when measured in accordance with Test Method D 1238. [F17]

**minimum required pressure**—one of a series of established pressure values for a plastic piping component (multilayer pipe, fitting, valve, and so forth) obtained by categorizing the long-term hydrostatic pressure strength in accordance with ISO 9080. [F17]

**minimum required strength**—one of a series of established stress values for a plastic compound obtained by categorizing the long-term hydrostatic strength determined by hydrostatic testing in accordance with ISO 9080. [F17]

**molding, blow**—see **blow molding**.

**molding, cold**—see **cold molding**.

**molding, compression**—see **compression molding**.

**molding, contact pressure**—a method of molding or laminating in which the pressure is only slightly more than necessary to hold the materials together during the molding operation. This pressure is usually less than 69 kPa (10 psi). [D20] D 883

**molding, high-pressure**—a method of molding or laminating in which the pressure used is greater than 1400 kPa (200 psi). [D20] D 883

**molding, injection**—see **injection molding**.

**molding, low-pressure**—a method of molding or laminating in which the pressure used is 1400 kPa (200 psi) or less. [D20] D 883

**molding pressure, compression**—the calculated fluid pressure applied to the material in the mold. [D20] D 883

**molding pressure, injection**—the pressure applied to the cross-sectional area of the material cylinder. [D20] D 883

**molding pressure, transfer**—the pressure applied to the cross-sectional area of the material pot or cylinder. [D20] D 883

**molding, transfer**—see **transfer molding**.

**monomer, n**—low-molecular weight substance consisting of molecules capable of reacting with like or unlike molecules to form a polymer. (See also **polymer**.) [D20] D 883

**multilayer pipe, n**—A pipe constructed of multiple layers that are bonded to each other and in which at least 60% of the wall thickness consists of polymeric material(s). [F17]

DISCUSSION—The different layers of polymeric or other kinds of material in a multilayer pipe may provide color, barrier, stiffness, strength of other properties for an intended application. In the US and Canada sometimes multilayer is referred to as composite pipe.

In the case of multilayer pipes intended for pressure applications two types of pipes are recognized as follows:

**Type 1 multilayer pipe**—A pressure rated pipe in which at least 60% of its wall thickness is comprised of a polymeric material that has an established HDB (Hydrostatic Design Basis) or MRS (Minimum Required Strength) from which the pressure rating of the pipe is determined.

DISCUSSION—An example of this type is co-extruded plastic pipe with an outer layer for barrier or color purposes. If this outer layer has the same HDB as the bulk wall, the entire wall thickness is used for pressure calculations; if not, only the bulk wall that has an HDB/MRS rating is used for pressure calculations.

**Type 2 multilayer pipe**—A pressure rated pipe in which at least 60% of the wall thickness is comprised of a polymeric material, and for which the pipe pressure rating has been determined for each pipe size and pipe wall construction based on the pipe’s experimentally established PDB (Pressure Design Basis) or MRP (Minimum Required Pressure).

DISCUSSION—An example of this type of pipe is PEX/AL/PEX.

**necking, n**—the localized reduction in cross section which may occur in a material under tensile stress. [D20] D 883

**non-pressure pipe**—pipe designed for gravity-conveyed medium which must resist only intermittent static pressures and does not have a pressure rating. [F17]

**non-standard virgin material**—a plastic resin or compound in the form of powder or pellets which does not meet the specification requirements for which it was manufactured, and has not been subjected to use or processing other than that required for its initial manufacture. [F17]

DISCUSSION—“Wide-spec,” “off-spec,” and “non-uniform virgin material” are industry terms synonymous with this definition.

**nylon plastics**—plastics based on resins composed principally of a long-chain synthetic polymer amide which has recurring amide groups as an integral part of the main polymer chain. [D20] D 883

**olefin plastics**—plastics based on polymers made by the polymerization of olefins or copolymerization of olefins with other monomers, the olefins being at least 50 mass %. [D20] D 883

**oligomer, n**—substance composed of only a few nonomeric units repetitively linked to each other, such as a dimer, trimer, tetramer, etc., or their mixtures. [D20] D 883

**open-cell cellular plastic, n**—a cellular plastic in which there is a predominance of interconnected cells. [D20] D 883

**orange-peel**—uneven surface somewhat resembling an orange peel. [F17]

**outdoor exposure**—normal weather conditions, that is, the sun’s rays, rain, air, temperature changes, and wind. [F17]

DISCUSSION—Exposure to atmospheres containing pollutants in excess of imposed federal, state, and local air quality standards is not considered normal “outdoor exposure.”

**out-of-roundness**—the allowed difference between the maximum measured diameter and the minimum measured diameter (stated as an absolute deviation). [F17.11] F 1488 [F17.63] F 1499

**ovality**—(%),

$$\frac{(\text{maximum measured diameter} - \text{minimum measured diameter})}{\text{average measured diameter}}$$

× 100

[F17]

**overall length**—the total length of the individual pipeline system, section, or fitting prior to installation. [F17]

**parallel laminate**—a laminate in which all the layers of material are oriented approximately parallel with respect to the grain or strongest direction in tension. (See also **cross laminate**.) [D20] D 883

**parison, n**—the shaped plastic mass, generally in the form of a tube, used in blow molding. ISO/ [D20] D 883

**pimple, n**—small, sharp, or conical elevation on the surface of a plastic. [F17]

**pipe, beveled**—see **beveled pipe**.

**pipe, composite**—see **composite pipe**.

**pipe, exfiltration**—see **exfiltration pipe**.

**pipe, infiltration**—see **infiltration pipe**.

**pipe, multilayer**—see **multilayer pipe**.

**pipe, non-pressure**—see **non-pressure pipe**.

**pipe, pressure**—see **pressure-pipe**.

**pipe spigot**—portion of a pipe or fitting which fits into a bell or socket of a preceding pipe or fitting. [F17]

**pipe zone backfill**—backfill in the area of the pipe, may be specified for depth and compaction. [F17]

**pit, n**—an imperfection, a small crater in the surface of the plastic, with its width approximately the same order of magnitude as its depth. [D20] D 883

**plastic(s), n**—a material that contains as an essential ingredient one or more organic polymeric substances of large molecular weight, is solid in its finished state, and, at some stage in its manufacture or processing into finished articles, can be shaped by flow. [D20] D 883

NOTE 1—Rubber, textiles, adhesives, and paint, which may in some cases meet this definition, are not considered plastics. See ASTM definitions of these terms.

NOTE 2—The above definition may be used as a separate meaning to the definitions contained in the dictionary for the adjective “plastic.”

NOTE 3—The plural form may be used as an adjective to refer to two or more plastic materials, for example, plastics industry. However, when the intent is to distinguish “plastic products” from “wood products” or “glass products,” the singular form should be used. As a general rule, if the adjective is to restrict the noun modified with respect to the type of material, “plastic” should be used; if the adjective is to indicate that more than one type of plastic material is or may be involved, “plastics” is permissible.

**plastic conduit**—plastic pipe or tubing used as an enclosure for electrical wiring. [F17]

**plasticizer, n**—a substance incorporated in a material to increase its workability, flexibility, or distensibility. [D20] D 883

**plastic, cellular**—see **cellular plastic**.

**plastic, expandable**—see **expandable plastic**.

**plastic, fluorocarbon**—see **fluorocarbon plastic**.

**plastic, open-cell cellular**—see **open-cell cellular plastic**.

**pipe, beveled**—see **beveled pipe**.

**plastic pipe**—a hollow cylinder of a plastic material in which the wall thicknesses are usually small when compared to the diameter and in which the inside and outside walls are essentially concentric. [D20] D 883

**plastic, reinforced**—see **reinforced plastic**.

**plastic, reprocessed**—see **reprocessed plastic**.

**plastic, rework (thermoplastic)**—see **rework plastic (thermoplastic)**.

**plastic, semirigid**—see **semirigid plastic**.

**plastic, thermally foamed**—see **thermally foamed plastic**.

**plastic tubing, n**—a particular size of smooth wall plastic pipe in which the outside diameter is essentially the same as the corresponding size of copper tubing. [F17]

**plastic, virgin**—see **virgin plastic**.

**plastics, acetal**—see **acetal plastics**.

**plastics, acrylonitrile-butadiene-styrene (ABS) pipe and fitting plastics**—see **acrylonitrile-butadiene-styrene (ABS) pipe and fitting plastics**.

**plastics, butylenes**—see **butylenes plastics**.

**plastics, cellulose acetate butyrate (CAB)**—see **cellulose acetate butyrate (CAB) plastics**.

**plastics, chlorinated poly (vinyl chloride)**—see **chlorinated poly(vinyl chloride) plastics**.

**plastics, chlorofluorocarbon**—see **chlorofluorocarbon plastics**.

**plastics, chlorofluorohydrocarbon**—see **chlorofluorohydrocarbon plastics**.

**plastics, closed-cell cellular**—see **closed-cell cellular plastics**.

**plastics, engineering**—see **engineering plastics**.

**plastics, ethylene**—see **ethylene plastics**.

**plastics, fluorohydrocarbon**—see **fluorohydrocarbon plastics**.

**plastics, high-density polyethylene (HDPE)**—see **high-density polyethylene plastics (HDPE)**.

**plastics, low-density polyethylene (LDPE)**—see **low-density polyethylene plastics (LDPE)**.

**plastics, medium-density polyethylene (MDPE)**—see **medium-density polyethylene plastics (MDPE)**.

**plastics, nylon**—see **nylon plastics**.

**plastics, olefin**—see **olefin plastics**.

**plastics, polybutylene**—see **polybutylene plastics**.

**plastics, polyethylene**—see **polyethylene plastics**.

**plastics, polyolefin**—see **polyolefin plastics**.

**plastics, polypropylene**—see **polypropylene plastics**.

**plastics, propylene**—see **propylene plastics**.

**plastics, styrene**—see **styrene plastics**.

**plastics, styrene-rubber (SR) pipe and fitting**—see **styrene-rubber (SR) pipe and fitting plastics**.

**plastics, styrene-rubber**—see **styrene-rubber plastics**.

**plastics, vinyl chloride**—see **vinyl chloride plastics**.

**vinylidene chloride**—see **vinylidene chloride plastics**.

**polybutylene, n**—a polymer prepared by the polymerization of butene as the sole monomer. (See polybutylene plastics and butylenes plastics.) [D20] D 883

**polybutylene plastics, n**—plastics based on polymers with butene as essentially the sole monomer. [D20] D 883

**polyethylene, n**—a polymer prepared by the polymerization of ethylene as the sole monomer. [D20] D 883

**polyethylene plastics**—plastics based on polymers made with ethylene as essentially the sole monomer. [D20] D 883

DISCUSSION—In common usage for this plastic, essentially means no less than 85 % ethylene and no less than 95 % total olefins.

**polymer, n**—a substance consisting of molecules characterized by the repetition (neglecting ends, branch junctions, and other minor irregularities) of one or more types of monomeric units., IUPAC [D20] D 883

**polyolefin, n**—a polymer prepared by the polymerization of an olefin(s) as the sole monomer(s). [D20] D 883

**polyolefin plastics, n**—plastics based on polymers made with an olefin(s) as essentially the sole monomer(s). [D20] D 883

**polypropylene, n**—a polymer prepared by the polymerization of propylene as the sole monomer. [D20] D 883

**polypropylene plastics**—plastics based on polymers made with propylene as essentially the sole monomer. [D20] D 883

**polystyrene, n**—a polymer prepared by the polymerization of styrene as the sole monomer. [D20] D 883

**poly(vinyl acetate), n**—a polymer prepared by the polymerization of vinyl acetate as the sole monomer. [D20] D 883

**poly(vinyl chloride)**—a polymer prepared by the polymerization of vinyl chloride as the sole monomer. (vinyl chloride content in monomer not less than 99%. [D20] D 883

**pot life**—the period of time during which a reacting thermosetting composition remains suitable for its intended processing after mixing with reaction-initiating agents. [D20] D 883

**pressure**—when expressed with reference to pipe, the force per unit area exerted by the test fluid in the piping product. Units will be reported as pounds per square inch gage (psig) or mega pascals gage (MPag). [D17.40] D 2837, F 948

**pressure design basis (PDB)**—one of a series of established pressure values for a plastic piping component (multilayer pipe, fitting, valve) obtained by categorizing the long-term hydrostatic pressure strength (LTHPS) determined in accordance with an industry test method that uses linear regression analysis. [F17.40] D 2837

DISCUSSION—Although Test Method D 2837 does not use “pressure values,” the PPI Hydrostatic Stress Board uses the principles of Test Method D 2837 in plotting log pressure versus log time to determine a “long-term hydrostatic pressure strength” and the resulting “Pressure Design Basis” for multilayer pipe that is listed in PPI TR-4.

**pressure pipe**—pipe designed to resist continuous pressure exerted by the conveyed medium. [F17]

**pressure rating (PR)**—the estimated maximum water pressure the pipe is capable of withstanding continuously with a high degree of certainty that failure of the pipe will not occur. The PR and HDS/HDB are related by the following equation.

$$PR = 2 (HDB) (DF) / (SDR-1) = 2 (HDS) / (SDR-1) \quad (1)$$

The PR and PDB are related by the following equation:

$$PR = (PDB) (DF) \quad (2)$$

[F17.11] F 1335, F 1986, F 1987 [F17.25] D 1785, D 2241, F 441/F 441M, F 442/F 442M [F17.26] D 2104, D 2239, D 2447, D 2737, D 3035, F 876 [F17.40] D 2837 [F17.61] D 1527, D 2282, F 771

**primer**—an organic solvent or a blend of solvents, which enhances adhesion, applied to plastic pipe and fittings prior to application of a solvent cement. [17.20] F 402

**propylene plastics, n**—plastics based on polymers of propylene or copolymers of propylene with other monomers, the propylene being in the greatest amount by mass. ISO [D20] D 883

**push-on joint**—see **joint, push-on**.

**qualification test**—an evaluation, generally nonrepetitive, conducted on an existing, altered, or new product to determine acceptability. [F17]

**qualification testing**—testing performed on a product to determine whether or not the product conforms to requirements of an applicable specification. [F17]

**quality assurance test**—a test in a program which is conducted to determine the quality level. [F17]

DISCUSSION—Quality assurance includes quality control, quality evaluation, and design assurance. A good quality assurance program is a coordinated system, not a sequence of separate and distinct steps.

**quality control test**—an in-plant test that is conducted on a given test frequency to determine whether product is in accordance with the appropriate specification(s). [F17]

**quick burst**—Not a preferred term (see **quick burst test**, **quick burst pressure**, and **quick burst strength**).

**quick burst pressure**—the internal pressure required to bring a piping component to failure when subjected to a quick burst test. [F17]

**quick burst strength**—the hoop stress resulting from the quick burst pressure. [F17]

**quick burst test**—an internal pressure test designed to produce failure of a piping component over a relatively short period of time, usually measured in seconds.

**referee test**—a test made to settle a disagreement as to conformance to specified requirements. [F17]

DISCUSSION—Modified from a definition in Test Methods C 114.

**reinforced plastic**—a plastic with high strength fillers imbedded in the composition, resulting in some mechanical properties superior to those of the base resin. (See also **filler**.) [D20] D 883

DISCUSSION—The reinforcing fillers are usually fibers, fabrics, or mats made of biers.

**release agent, n**—a material added to a compound or applied to the mold cavity, or both, to reduce parts sticking to the mold. [D20] D 883

**reprocessed plastic**—a thermoplastic prepared from usually melt processed scrap or reject parts by a plastics processor, or from non-standard or non-uniform virgin material. [D20] D 883

DISCUSSION—Use of the term “scrap” in this definition does not connote that the feed stock is necessarily less desirable or usable than the virgin material from which it may have been generated. Reprocessed plastic may or may not be reformulated by the addition of fillers, plasticizers, stabilizers, pigments, etc.

**resin, n**—a solid or pseudosolid organic material, often of high molecular weight, which exhibits a tendency to flow when subjected to stress, usually has a softening or melting range, and usually fractures conchoidally. [D20] D 883

DISCUSSION—In a broad sense, the term is used to designate any polymer that is a basic material for plastics.

**rework plastic (thermoplastic)**—a plastic from a manufacturer’s own production that has been reground or pelletized for reuse by that same manufacturer. [F17]

DISCUSSION—In many specifications the use of reworked material is

limited to clean plastic that meets the requirements specified for virgin material, and yields a product equal in quality to one made from only virgin material. See **recycled plastic** and **reprocessed plastic**.

**rubber**—a material that is capable of recovering from large deformations quickly and forcibly, and can be, or already is, modified to a state in which it is essentially insoluble (but can swell) in boiling solvent, such as benzene, methylethylketone, and ethanoltoluene azeotrope.

A rubber in its modified state, free of diluents, retracts within 1min to less than 1.5 times its original length after being stretched at room temperature (18 to 29°C) to twice its length and held for 1 min before release. (D-11) [F11]

D 1079

**runner, n**—(1) the secondary feed channel in an injection or transfer mold that runs from the inner end of the sprue to the cavity gate.

(2) the piece formed in a secondary feed channel or runner. [D20] D 883

**saddle-fused joint**—see **joint, saddle-fused**.

**sample**—one or more units of product randomly selected from a lot to represent that lot. [F17]

**schedule**—a pipe size system (outside diameters and wall thicknesses) originated by the iron pipe industry. [F17]

**semirigid plastic, n**—for the purposes of general classification, a plastic that has a modulus of elasticity either in flexure or in tension of between 70 and 700 MPa (10 000 and 100 000 psi) at 23°C and 50% relative humidity when tested in accordance with Test Method D 638, Test Method D 747, Test Method D 790, or Test Method D 882. [D20] D 883

**service factor**—a factor which is used to reduce a strength value to obtain an engineering design stress. The factor may vary depending on the service conditions, the hazard, the length of service desired, and the properties of the pipe. [F17]

**set, n**—strain remaining after complete release of the force producing the deformation. [D20] D 883

**set, v**—to convert an adhesive into a fixed or hardened state by physical or chemical action, such as condensation, polymerization, oxidation, vulcanization, gelation, hydration, or evaporation of volatile constituents. [D14] D 907

**short, n**—an imperfection in molded plastic part due to, an incompletely filled out condition. [D20] D 883

DISCUSSION—This may be evident either through an absence of surface film in some areas, or as lighter unfused particles of material showing through a covering surface film, accompanied possibly by thin-skinned blisters.

**shrink mark**—an imperfection, a depression in the surface of a molded material where it has retracted from the mold. [D20] D 883

**skin, n**—a relatively dense layer at the surface of a cellular polymeric material. [D20] D 883

**slit failure**—a form of brittle failure which exhibits only a very small crack through the wall of the pipe with no visible (to the naked eye) material deformation in the area of the break. [F17]

**socket**—the portion of a jointing system that is designed to accept a plain-end pipe or spigot-end pipe. [F17]

**socket end**—the end portion of a piping component which is designed to accept a plain-end piping component or spigot-end piping component. [F17]

*socket-fused joint*—see **joint, socket-fused**.

**soil compaction**—see **compaction, soil**.

**solvent cement**—an adhesive made by dissolving a plastic resin or compound in a suitable solvent or mixture of solvents. The solvent cement dissolves the surfaces of the pipe and fittings to form a bond between the mating surfaces provided the proper cement is used for the particular materials and proper techniques are followed. [F17]

*solvent-cemented joint*—see **joint, solvent-cemented**.

**solvent cementing**—making a pipe joint with a solvent cement. (See **solvent cement**.) [F17]

**solvent cement joint**—a joint made by using a solvent cement to unite the components. [F17]

DISCUSSION—The solvent cement softens or dissolves the surfaces of the components, which then solidify as the solvent evaporates.

**solvent joint**—a joint made by using a solvent to unite the components. [F17]

DISCUSSION—The solvent softens or dissolves the surfaces of the components which then solidify as the solvent evaporates.

**specifying agency**—the individual engineer, firm, or political subdivision charged with and having responsibility for the design of a facility, product, equipment, or material requirements. [F17]

**specimen, n**—a piece or portion of a sample used to make a test. ISO/ [D20] D 883

**spring line**—a line along the length of the pipe at its maximum width along a horizontal plane. [F17]

**sprue, n**—(1) the primary feed channel that runs from the outer face of an injection or transfer mold, to the mold gate in a single cavity mold or a runner in multiple-cavity mold; (2) the piece of material formed in the primary feed channel opening. [F17]

**stabilizer**—an ingredient added to a plastic to retard possible degradation. [F17]

DISCUSSION—Generally added for processing heat protection or for environmental protection, or both.

**standard dimension ratios (SDR)**—a specific ratio of the average specified outside diameter to the minimum specified wall thickness ( $D_o/t$ ) for outside diameter-controlled plastic pipe, the value of which is derived by adding one to the pertinent number selected from the ANSI Preferred Number Series 10. Some of the values are as follows:

ANSI Preferred Number Series 10	SDR
5.0	6.0
6.3	7.3
8.0	9.0
10.0	11.0
12.5	13.5
16.0	17.0
20.0	21.0
25.0	26.0
31.5	32.5
40.0	41.0
50.0	51.0
63.0	64.0

(See reference: ANSI Preferred Numbers, Z17.1 (Designated as R 10 in ISO 3 and ISO 497).) [F17]

**standard inside diameter dimension ratio (SIDR)**—a specific ratio of the average specified inside diameter to the minimum specified wall thickness ( $D_i/t$ ) for inside diameter-controlled plastic pipe, the value of which is derived by subtracting one from the pertinent number selected from the ANSI Preferred Number Series 10. Some of the values are as follows:

ANSI Preferred Number Series 10	SIDR
5.0	4.0
6.3	5.3
8.0	7.0
10.0	9.0
12.5	11.5
16.0	15.0
20.0	19.0
25.0	24.0
31.5	30.5
40.0	39.0
50.0	49.0
63.0	62.0

(See reference: ANSI Preferred Numbers, Z17.1 (Designated as R 10 in ISO 3 and ISO 497).) [F17]

**strain**—the change per unit of length in a linear dimension of a body, that accompanies a stress. [F17]

DISCUSSION—Strain is a dimensionless quantity which may be measured conveniently in percent, in inches per inch, in millimetres per millimetre, etc.

**strength**—the stress required to break, rupture, or cause a failure. [F17]

**strength design basis**—one of a series of established stress values (specified in Test Method D 2837) for a plastic molding compound obtained by categorizing the long-term strength determined in accordance with Test Method F 2018. [F17]

DISCUSSION—The SDB is used only for a material intended for molding applications. The SDB shall not be used for pipe applications.

**stress crack, environmental, n**—a stress crack, the development of which has been accelerated by the environment to which the plastic is exposed. (See **stress-crack**.) [F17]

**stress, hoop**—see **hoop stress**.

**stress relaxation**—the decrease in stress, at constant strain, with time. [F17]

**styrene plastics, n**—plastics based on polymers of styrene or copolymers of styrene with other monomers, the styrene being the greatest amount by mass. ISO [D20] D 883

**styrene-rubber (SR) pipe and fitting plastics**—plastics containing at least 50% styrene plastics combined with rubbers and other compounding materials, but not more than 15 % acrylonitrile. [F17]

**styrene-rubber plastics, n**—plastics based on styrene polymers and rubbers, the styrene polymers being in the greatest amount by mass. ISO [D20] D 883

**sustained pressure test**—a constant internal pressure test for an extended period of time. [F17]

DISCUSSION—One thousand hours is a commonly used period of time.

*sweep*—see **bend**.

**syneresis, *n***—the contraction of a gel accompanied by the separation of a liquid. **ISO [D20] D 883**

**telomer, *n***—a polymer composed of molecules having terminal groups incapable of reacting with additional monomers, under the conditions of the synthesis, to form larger polymer molecules of the same chemical type. **ISO, IUPAC, [D20] D 883**

**test section**—portion(s) of a pipe, fitting, or pipeline under test. **[F17]**

**test, qualification**—see **qualification test**.

**test, quality assurance**—see **quality assurance test**.

**test, quality control**—see **quality control test**.

**test, quick burst**—see **quick burst test**.

**test, referee**—see **referee test**.

**test, sustained pressure**—see **sustained pressure test**.

**testing, acceptance**—see **acceptance testing**.

**testing, elevated temperature**—see **elevated temperature testing**.

**testing, qualification**—see **qualification testing**.

**thermally foamed plastic**—a cellular plastic produced by applying heat to effect gaseous decomposition or volatilization of a constituent. **[D20] D 883**

**thermoplastic, *n***—a plastic that repeatedly can be softened by heating and hardened by cooling through a temperature range characteristic of the plastic, and that in the softened state can be shaped by flow into articles by molding or extrusion. **[D20] D 883**

**thermoplastic, *adj***—capable of being repeatedly softened by heating and hardened by cooling through a temperature range characteristic of the plastic, and that in the softened state can be shaped by flow into articles by molding or extrusion for example. **[D20] D 883**

**DISCUSSION**—Thermoplastic applies to those materials whose change upon heating is substantially physical.

**thermoplastic piping compound**—a mixture of a thermoplastic polymer with other ingredients such as fillers, stabilizers, catalysts, processing aids, lubricants, modifiers, pigments, or curing agents, but not plasticizers except in the case of CAB piping compound. **[F17]**

**thermoset, *n***—a plastic that, after having been cured by heat or other means, is substantially infusible and insoluble. **[D20] D 883**

**thermosetting, *adj***—capable of being changed into a substantially infusible or insoluble product when cured by heat or other means. **[D20] D 883**

**toe-in**—a small reduction of the outside diameter at the cut end of a length of thermoplastic pipe. **[F17]**

**transfer molding**—a method of forming articles by fusing a plastic material in a chamber and then forcing essentially the whole mass into a hot mold where it solidifies. **[D20] D 883**

**transition, first order**—a change of state, associated with crystallization or melting in a polymer. **[D20] D 883**

**vinyl chloride plastics**—plastics based on polymers of vinyl chloride or copolymers of vinyl chloride with other monomers, the vinyl chloride being in the greatest amount by mass. **ISO/[D20] D 883**

**vinylidene chloride plastics**—plastics based on polymer resins made by the polymerization of vinylidene chloride or copolymerization of vinylidene chloride with other unsaturated compounds, the vinylidene chloride being in the greatest amount by weight. **[D20] D 883**

**virgin plastic**—a plastic material in the form of pellets, granules, powder, floc, or liquid that has not been subjected to use or processing other than that required for its initial manufacture. **[D20] D 883**

**viscosity**—the property of resistance to flow exhibited within the body of a material. **[D20] D 883**

**DISCUSSION**—This property can be expressed in terms of the relationship between shear stress and corresponding rate of strain in shear. Viscosity is usually taken to mean “Newtonian Viscosity,” in which case the ratio of shearing strain is constant. In non-Newtonian behavior, which is usual with plastic materials, the ratio varies with the parameters of the experiment. Such ratios are often called “apparent viscosities.” (See **viscosity coefficient**.)

**viscosity coefficient**—the shearing stress necessary to induce a unit velocity flow gradient in a material. **[D20] D 883**

**DISCUSSION**—In actual measurement, the viscosity coefficient of a material is obtained from the ratio of shearing stress to shearing rate. This assumes the ratio to be constant and independent of the shearing stress, a condition which is satisfied only by Newtonian fluids. Consequently, in all other cases, values obtained are apparent and represent one point on the flow curve. The viscosity coefficient is expressed in pascal-seconds (or poises). (See **viscosity**.)

**void, *n***—(1) in a solid plastic, an unfilled space of such size that it scatters radiant energy such as light.

(2) a cavity unintentionally formed in a cellular material and substantially larger than the characteristic individual cells. **ISO [D20] D 883**

**vulcanization, *n***—an irreversible process during which a rubber compound, through a change in its chemical structure (for example, cross-linking), becomes less plastic and more resistant to swelling by organic liquids and elastic properties are conferred, improved, or extended over a greater range of temperature. **[D20] D 883**

**water service**—the pipe from the water main or other source of water supply to the building or other point of use or distribution. **[F17]**

**weld-mark, *n***—a visible weld line. **[D20] D 883**

**width**—in the case of a beam, the cross-sectional dimension perpendicular to the direction in which the load is applied. **[D20] D 883**

## ANNEX

## (Mandatory Information)

## A1. GLOSSARY – HYPHENATION

A1.1 In F17 standards the following word combinations should be hyphenated:

- intercept-values category
- pressure-intercept value
- pressure-regression line
- pressure-rating categories

A1.2 In F17 standards the following word combinations need not be hyphenated:

- external pressure test
- internal pressure test
- tensile strength requirements
- tensile strength test
- mechanical joint qualification test
- constant load test
- long term creep
- assembled test specimen
- mechanical joint performance test
- medium tensile load
- cross sectional area

- long term data
- fitting failure data
- long term hydrostatic pressure rating
- long term pressure rating
- fitting pressure rating
- socket type fitting
- mechanical end closure
- solvent cemented cap
- solvent cement joint
- primary fitting pattern
- short term data
- Lower Confidence Line (LCL)
- water filled pipe
- fitting material type and grade
- socket wall thickness
- minimum wall thickness
- cell class
- data point requirements
- long term testing
- system pressure needs

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