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~~Designation:D2513–07a~~ Designation: D 2513 – 07b

An American National Standard

Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings[1]

This standard is issued under the fixed designation D 2513; 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 specification covers requirements and test methods for material (see Appendix X1) dimensions and tolerances, hydrostatic burst strength, chemical resistance, and impact resistance of plastic pipe, tubing, and fittings for use in fuel gas mains and services for direct burial and reliner applications. The annexes provide specific requirements and test methods for each of the materials currently approved. If and when additional materials are available, specific annex requirements will be added. The pipe and fittings covered by this specification are intended for use in the distribution of natural gas. Requirements for the qualifying of polyethylene systems for use with liquefied petroleum gas are covered in Annex A1.

1.1.1 This specification does not cover threaded pipe. Design considerations are discussed in Appendix X2. In-plant quality control programs are specified in Annex A3 and Annex A4.

1.2 The text of this specification references notes, footnotes, and appendixes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

1.4 The following is an index of the annexes and appendixes in this specification:

~~Annex~~ Annex	~~Subject A1~~ Subject
~~Annex A1~~	~~Polyethylene (PE) Pipe and Fittings A2~~
Annex A1	Polyethylene (PE) Pipe and Fittings
~~Annex A2~~	~~Poly (Vinyl Chloride) (PVC) Pipe and Fittings for Maintenance or Repair A3~~
Annex A2	Poly (Vinyl Chloride) (PVC) Pipe and Fittings for Maintenance or Repair
~~Annex A3~~	~~In-Plant Quality Control for all materials up to 12 in. A4~~
Annex A3	In-Plant Quality Control for all materials up to 12 in.
~~Annex A4~~	~~In-Plant Quality Control for PE materials between 14 and 24 in. A5~~
Annex A4	In-Plant Quality Control for PE materials between 14 and 24 in.
~~Annex A5~~	~~Polyamide (PA) Pipe and Fittings A6~~
Annex A5	Polyamide (PA) Pipe and Fittings
~~Annex A6~~	~~Magnetic-detectable Polyethylene Pipe A7~~
Annex A6	Magnetic-detectable Polyethylene Pipe
Annex A7	Crosslinked Polyethylene (PEX) Pipe
Annex A8	Peelable PE Pipe

~~Appendixes~~ Appendixes	~~Subject X1~~ Subject
~~Appendix X1~~	~~New Materials X2~~
Appendix X1	New Materials
~~Appendix X2~~	~~Design Consideration X3~~
Appendix X2	Design Consideration
Appendix X3	Gas Pressure Pipe and Fittings Produced from Polyethylene (PE) materials with Minimum Required Strength (MRS) Designation

1.5 The following precautionary caveat pertains only to the test method portion, Section 6, of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

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[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.60 on Gas.
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2. Referenced Documents

2.1 *ASTM Standards:* [2]

2.1.1 *Terminology:*

D 1600 Terminology for Abbreviated Terms Relating to Plastics

F 412 Terminology Relating to Plastic Piping Systems

2.1.2 *Test Methods for:*

D 638 Test Method for Tensile Properties of Plastics

D 789 Test Methods for Determination of Solution Viscosities of Polyamide (PA)

D 792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

D 1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

D 1505 Test Method for Density of Plastics by the Density-Gradient Technique

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D 1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D 2152 Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion

D 2290 Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe by Split Disk Method

D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

D 2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)

D 2765 Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics

D 2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

D 2855 Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

D 4883 Test Method for Density of Polyethylene by the Ultrasound Technique

F 402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

F 1473 ~~Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins~~ Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins

F 1784 Test Method for Performance of a Pasta Cooker

2.1.3 *Practices for:*

D 543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents

D 618 Practice for Conditioning Plastics for Testing

D 1898 Sampling of Plastics

D 2657 Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

D 2774 Practice for Underground Installation of Thermoplastic Pressure Piping

2.1.4 *Specification for:*

D 1248 Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

D 1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D 2241 Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

D 2466 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

D 2467 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D 2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

D 2672 Specification for Joints for IPS PVC Pipe Using Solvent Cement

D 2740 Specification for Polyvinyl Chloride (PVC) Plastic Tubing[3]

D 2683 Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

D 3261 Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

D 3350 Specification for Polyethylene Plastics Pipe and Fittings Materials

D 4066 Classification System for Nylon Injection and Extrusion Materials (PA)

D 4101 Specification for Polypropylene Injection and Extrusion Materials

F 1055 Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

F 1563 Specification for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing

F 1733 Specification for Butt Heat Fusion Polyamide(PA) Plastic Fitting for Polyamide(PA) Plastic Pipe and Tubing

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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] ~~Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.~~

[3] Withdrawn.

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F 2138Specification for Excess Flow Valves for Natural Gas Service
D3350Specification for Polyethylene Plastics Pipe and Fittings Materials Specification for Excess Flow Valves for Natural Gas Service

2.2 *ANSI Standards:*
B 16.40 Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems[4]
B 31.8 Gas Transmission and Distribution Piping Systems[4]
2.3 *Federal Specifications:*
Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[5]
OPS 49 CFR Part 192 Title 49, Code of Federal Regulations[5]
2.4 *Military Standards:*
MIL-STD-129 Marking for Shipment and Storage[5]
MIL-STD-1235 (ORD) Single- and Multi-Level Continuous Sampling Procedures and Tables for Inspection by Attributes
2.5 *Other Documents: ISO Standards[6]:*
National Fire Protection Association: NFPA58,Storage and Handling Liquefied Petroleum Gases ISO 4437 Buried polyethylene (PE) pipes for the supply of gaseous fuels-Metric series-Specifications
PPI TR-33,Generic Butt Fusion Joining for Polyethylene Gas Pipe ISO 11922-1 Thermoplastics pipes for the conveyance of fluids–Dimensions and tolerances —Part 1: Metric series
PPI TR-41,Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping[6] ISO 17454 Plastics piping systems - multilayer pipe - test method for the adhesion of the different layers using a pulling rig.
PPI TN-30/2006Requirements for the Use of Rework Materials in Polyethylene Gas Pipe[6] ISO 9080 Thermoplastics Pipes for the Transport of Fluids—Methods of Extrapolation of Hydrostatic Stress Rupture Data to Determine Long-Term Hydrostatic Strength of Thermoplastic Pipe Materials
ISO 12162 Thermoplastic Materials for Pipes and Fittings for Pressure Applications—Classification and Designation—Overall Service (Design) Coefficient
2.6 *Plastic Pipe Institute[7]*
PPI TR-33 Generic Butt Fusion Joining for Polyethylene Gas Pipe
PPI TR3 Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB)
PPI TR4 Hydrostatic Design Bases and Maximum Recommended Hydrostatic Design Stresses for Thermoplastic Piping Materials
PPI TR-41, Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping[7]
PPI TN-30/2006 Requirements for the Use of Rework Materials in Polyethylene Gas Pipe[7]
PPI TN-7 Nature of Hydrostatic Stress Rupture Curves
2.7 *Other Documents:*[8]
National Fire Protection Association: NFPA 58, Storage and Handling Liquefied Petroleum Gases

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3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F 412, and abbreviations are in accordance with Terminology D 1600, unless otherwise specified.

3.2 The gas industry terminology used in this specification is in accordance with ANSI B31.8 or 49 CFR Part 192, unless otherwise indicated.

3.3 The term *pipe* used herein refers to both pipe and tubing unless specifically stated otherwise.

3.4 *re-rounding equipment*—equipment used to reform the pipe and permanently reduce ovality to 5% or less.

3.5 *rounding equipment*—equipment, devices, clamps, and so forth, used to temporarily hold the pipe round while out-of-roundness measurements are made, or a joining procedure (heat fusion, electrofusion, or mechanical) is performed.

3.6 *standard thermoplastic material designated code* —the pipe material designation code shall consist of the abbreviation for the type of plastic (PE, PVC, or PA) followed by Arabic numerals which describe the short term properties in accordance with applicable ASTM standards, the hydrostatic design stress for water at 73.4°F (23°C) in units of 100 psi with any decimal figures dropped. Where the hydrostatic design stress code contains less than two figures, a zero is used before the number. Thus, a complete material designation code shall consist of two or three letters and four figures for plastic pipe materials. For example,

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[4] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA19111–5094, Attn: NPODS.
[4] F17Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[5] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.
[5] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111 – 5094, Attn: NPODS.
[6] Plastic Pipe Institute, Inc., (PPI) 105 Decker Court, Suite 825 Irving TX, 75062.
[6] Available from International Organization for Standardization 1 Rue de Varembé, Case Postale 56, CH-1211, Geneva 20, Switzerland
[7] The boldface numbers in parentheses refer to the list of references at the end of this standard.
[7] Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.
[8] Available from International Organization for Standardization 1 Rue de Varembé, Case Postale 56, CH-1211, Geneva 20, Switzerland
[8] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

PE2708 is a ~~polyethylene with a density cell class of 2 and a slow crack growth resistance cell class of 7 as per Specification D3350~~grade PE27 polyethylene with an 800psi design stress for water at 73.4°F (23°C). The hydrostatic design stresses for gas are not used in this designation code.

3.7 *thermoplastic pipe dimension ratio (DR)*—the ratio of pipe diameter to wall thickness. It is calculated by dividing the specified outside diameter of the pipe, in inches, by the minimum specified wall thickness, in inches. The standard dimension ratio (SDR) is a common numbering system which is derived from the ANSI preferred number series R 10.

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

4. Materials

4.1 *General*—The plastic used to make pipe and fittings shall be virgin plastic or reworked plastic (see 4.2) as specified in the Annexes and shall have a Plastics Pipe Institute (PPI) long-term hydrostatic design stress and hydrostatic design basis rating.

4.2 *Rework Material*—Clean rework material of the same commercial designation, generated from the manufacturer's own pipe and fitting production shall not be used unless the pipe and fitting produced meet all the requirements of this specification.

NOTE 1—References and material descriptions for ABS, CAB, PB, PE2306, PE2406, PE3306, PE3406 and PE3480 have been removed from D 2513. Elimination of these materials does not affect the ~~use of pipes and fittings that were produced when these products were in the standard nor does it affect the~~ pipelines that are in service. They can still be used for gas distribution. The main reason for removing these materials from this standard is to reflect the current state of the art in gas distribution plastic piping.

4.3 *Documentation* —A documentation system to allow for traceability of raw materials including percentage and material classification (or designation, if applicable) of rework materials used in the manufacture of the pipe product meeting the requirements of this specification shall exist and be supplied to the purchaser, if requested.

5. Requirements

5.1 *General*—See the annexes for specific product requirements in addition to the following. Pipe shall be supplied in either coils or straight lengths. Any pipe supplied in coils must meet the same requirements before and after coiling.

5.2 *Workmanship*—The pipe and fittings shall be homogeneous throughout and free of visible cracks, holes, foreign inclusion, blisters, and dents, or other injurious defects. The pipe and fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

5.3 *Pipe and Tubing Dimensions and Tolerances*:

5.3.1 *Dimension*—The dimensions shall be specified by wall thickness and outside diameter.

5.3.1.1 *Diameters*—The outside diameter shall meet the requirements given in Table 1 or Table 2 when measured in accordance with 6.5.

5.3.1.2 *Toe-In*—When measured in accordance with 6.5.1.1, the outside diameter at the cut end of the pipe shall not be more than 1.5 % smaller than the undistorted outside diameter. Measurement of the undistorted outside diameter shall be made no closer than 1.5 pipe diameters or 11.8 in. (300 mm), whichever distance is less, from the cut end of the pipe. Undistorted outside diameter shall meet the requirements of Table 1 or Table 2.

5.3.1.3 *Wall Thickness*—The wall thickness shall be as specified in Table 2 or Table 3 when measured in accordance with 6.5.1.2. The minimum wall thickness at any point of measurement shall be not less than the minimum wall thickness specified in Table 2 or Table 3.

5.3.1.4 *Wall Thickness Eccentricity Range*— The wall thickness eccentricity range shall be within 12 % when measured in accordance with 6.5.1.3.

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TABLE 1 Outside Diameters and Tolerances for Plastic Pipe, in. (mm)

Nominal Pipe Size	Outside Diameter	Tolerance	Maximum Out-of-Roundness			
			SDR 32.5	SDR 26	SDR 21	SDR 17 SDR 13.5 SDR 11
½	0.840 (21.3)	±0.004 (±0.102)	...	...	0.03(0.762)	0.016(0.406)
¾	1.050 (26.7)	±0.004 (±0.102)	...	...	0.03(0.762)	0.02(0.508)
1	1.315 (33.4)	±0.005 (±0.127)	...	...	0.03(0.762)	0.02(0.508)
1¼	1.660 (42.1)	±0.005 (±0.127)	...	...	0.03(0.762)	0.024(0.61)
1½	1.900 (48.3)	±0.006 (±0.152)	...	...	0.06(1.524)	0.024(0.61)
2	2.375 (60.3)	±0.006 (±0.152)	...	...	0.06(1.524)	0.024(0.61)
2½	2.875 (73.0)	±0.007 (±0.179)	...	...	0.06(1.524)	0.03(0.762)
3	3.500 (88.9)	±0.008 (±0.203)	...	...	0.06(1.524)	0.03(0.762)
3½	4.000 (101.6)	±0.008 (±0.203)	...	...	0.1(2.5)	0.03(0.762)
4	4.500 (114.3)	±0.009 (±0.229)	...	...	0.1(2.5)	0.03(0.762)
5	5.563 (141.3)	±0.010 (±0.254)	...	...	0.1(2.5)	0.06(1.524)
6	6.625 (168.3)	±0.011 (±0.279)	0.12(3)	0.11(2.74)	0.1(2.5)	0.07(1.778)
8	8.625 (219.1)	±0.013 (±0.330)	0.24(6.1)	0.16(4.06)	0.12(3)	0.08(2.04)
10	10.750 (273.0)	±0.015 (±0.381)	0.24(6.1)	0.2(5.08)	0.14(3.58)	0.1(2.5)
12	12.750 (323.8)	±0.017 (±0.432)	0.28(7.12)	0.2(5.08)	0.14(3.58)	0.1(2.5)

TABLE 2 Plastic Tubing-Diameters, Wall Thicknesses, and Tolerances, in. (mm)

Nominal Tubing Size (CTS)	Outside Diameter	Tolerance	Minimum Wall Thickness	Wall Thickness Tolerance
¼	0.375 (9.52)	±0.004 (±0.10)	0.062 (1.58)	+0.006 (+0.15)
⅜	0.500 (12.7)	±0.004 (±0.10)	0.062 (1.58)	+0.006 (+0.15)
½	0.625 (15.9)	±0.004 (±0.10)	0.062 (1.58)	+0.006 (+0.15)
½	0.625 (15.9)	±0.004 (±0.10)	0.090 (2.27)	+0.009 (+0.23)
½	0.625 (15.9)	±0.004 (±0.10)	0.104 (2.64)	+0.010 (+0.25)
¾	0.875 (22.2)	±0.004 (±0.10)	0.062 (1.58)	+0.006 (+0.15)
¾	0.875 (22.2)	±0.004 (±0.10)	0.077 (1.95)	+0.008 (+0.20)
¾	0.875 (22.2)	±0.004 (±0.10)	0.090 (2.27)	+0.009 (+0.23)
1	1.125 (28.6)	±0.005 (±0.13)	0.062 (1.58)	+0.007 (+0.18)
1	1.125 (28.6)	±0.005 (±0.13)	0.090 (2.27)	+0.011 (+0.28)
1	1.125 (28.6)	±0.005 (±0.13)	0.099 (2.51)	+0.012 (+0.31)
1	1.125 (28.6)	±0.005 (±0.13)	0.101 (2.56)	+0.012 (+0.31)
1	1.125 (28.6)	±0.005 (±0.13)	0.121 (3.07)	+0.015 (+0.38)
1¼	1.375 (34.9)	±0.005 (±0.13)	0.062 (1.58)	+0.007 (+0.18)
1¼	1.375 (34.9)	±0.005 (±0.13)	0.090 (2.27)	+0.011 (+0.28)
1¼	1.375 (34.9)	±0.005 (±0.13)	0.121 (3.07)	+0.015 (+0.38)
1¾	1.875 (47.6)	±0.006 (±0.15)	0.062 (1.58)	+0.007 (+0.18)

5.3.1.5 *Ovality*—The ovality (cross section) of 3 in. IPS (88.9 mm) and smaller pipe shall not exceed 5 % when measured in accordance with 6.5.3. Measurements of coiled pipe shall be made on a sample cut from the coil, and in case of disagreement, conditioned per 6.3.

NOTE 2—Other factors, that is, installation compaction, static soil loading, and dynamic vehicular loads may increase the ovality; therefore, 5 % was chosen as the limit for the amount contributed by manufacturing, packing, in-plant storage, and shipping. For further information, see **(1)**.[9]

(1) Before or during installation, coiled pipe larger than 3 in. IPS (88.9 mm) shall be processed by the installer through re-rounding equipment that corrects ovality to 5% or less.

NOTE 3—Ovality is a packaging condition that occurs when roundable pipe is wound into a coil—the pipe flattens out as it is coiled. Ovality is corrected when joining equipment is applied to roundable pipe, or by field processing roundable pipe through re-rounding and straightening equipment during installation.

5.3.1.6 *Length*—The pipe shall be supplied in straight lengths or coils as agreed upon between the manufacturer and the purchaser. The length shall not be less than the minimum length agreed upon when corrected to 73°F (23°C).

5.3.1.7 When sizes other than those listed in Table 1, Table 2, or Table 3 are used, tolerances shall be: for outside diameter, use same tolerance of next smaller size; for wall thickness, use same tolerance percentage as shown in the tables.

5.3.2 *Fittings*—Fittings shall meet the requirements given in the applicable Annex.

5.4 *Chemical Resistance*—The pipe and fittings shall not increase in weight more than 0.5 % (1.0 % for toluene in methanol). Where the test specimen is a pipe ring, the material shall not change more than ±12 % in apparent tensile yield strength when measured in accordance with 6.9. Where the test specimen is a plaque, the material shall not change more than ±12 % in tensile strength at yield when measured in accordance with Test Method D 638. See Annex A5 for specific requirements for polyamide pipe.

NOTE 4—This pipe test is only an indication of what will happen as a result of short term exposure to these chemicals. For longterm results, additional testing is required.

5.5 *Sustained Pressure*—The pipe, fittings, or systems shall not fail as defined in Test Method D 1598, when tested in accordance with 6.6.

5.6 *Elevated Temperature Service*—Plastic piping materials intended for use at temperatures above 100°F (38°C) shall have the PPI hydrostatic design basis (HDB) determined at the specific temperature in accordance with Test Method D 2837. The 100 000-h intercept (long-term strength) shall be categorized in accordance with Table 4 and be listed as the "hydrostatic design basis of XXX psi at XXX °F (C°) for (compound name)."

NOTE 5—Many design factors for elevated temperature service cannot be covered in this specification. Users should consult applicable codes for limitations on pertinent maximum temperatures.

NOTE 6—In the absence of an HDB established at the specified temperature, the HDB of a higher temperature may be used in determining a design pressure rating at the specified temperature by arithmetic interpolation.

[9] Supporting data are available from ASTM Headquarters. Request RR: F17-1018.

[9] The boldface numbers in parentheses refer to the list of references at the end of this standard.

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TABLE 3 Wall Thicknesses and Tolerances for Plastic Pipe, in (mm)[A,B]

Nominal Pipe Size (IPS)	DR[C]	Minimum	Tolerance
½	D	0.062 (1.58)	+0.007 (+0.178)
	11.0	0.076 (1.93)	+0.009 (+0.229)
	9.33	0.090 (2.29)	+0.011 (+0.279)
¾	D	0.090 (2.29)	+0.011 (+0.279)
	11.0	0.095 (2.41)	+0.011 (+0.279)
	Sch 40	0.113 (2.87)	+0.014 (+0.356)
1	D	0.090 (2.29)	+0.011 (+0.279)
	13.5	0.097 (2.46)	+0.012 (+0.305)
	11.0	0.120 (3.05)	+0.014 (+0.356)
	9.9	0.133 (3.38)	+0.016 (+0.406)
	9.33	0.140 (3.56)	+0.017 (+0.432)
1¼	D	0.090 (2.29)	+0.011 (+0.279)
	17.0	0.098 (2.49)	+0.012 (+0.305)
	13.5	0.123 (3.12)	+0.015 (+0.381)
	Sch 40	0.140 (3.56)	+0.017 (+0.432)
	11.0	0.151 (3.84)	+0.018 (+0.457)
	10.0	0.166 (4.22)	+0.020 (+0.508)
	9.33	0.178 (4.52)	+0.021 (+0.533)
	6.0	0.277 (7.04)	+0.033 (+0.838)
1½	D	0.090 (2.29)	+0.011 (+0.279)
	17	0.112 (2.85)	+0.013 (+0.330)
	13.5	0.141 (3.58)	+0.017 (+0.432)
	Sch 40	0.145 (3.68)	+0.017 (+0.432)
	11	0.173 (4.39)	+0.021 (+0.533)
2	21	0.113 (2.87)	+0.014 (+0.356)
	17	0.140 (3.56)	+0.017 (+0.432)
	Sch 40	0.154 (3.91)	+0.018 (+0.457)
	13.5	0.176 (4.47)	+0.021 (+0.533)
	11	0.216 (5.49)	+0.026 (+0.660)
	9.33	0.255 (6.48)	+0.031 (+0.787)
2½	21	0.137 (3.48)	+0.016 (+0.406)
	17	0.169 (4.29)	+0.020 (+0.508)
	13.5	0.213 (5.41)	+0.026 (+0.660)
	11	0.261 (6.63)	+0.031 (+0.787)
3	21	0.167 (4.24)	+0.020 (+0.508)
	17	0.206 (5.23)	+0.025 (+0.635)
	Sch 40	0.216 (5.49)	+0.026 (+0.660)
	13.5	0.259 (6.58)	+0.031 (+0.787)
	11.5	0.304 (7.72)	+0.036 (+0.914)
	11	0.318 (8.08)	+0.038 (+0.965)
	9.33	0.375 (9.53)	+0.045 (+1.143)
3½	21	0.190 (4.83)	+0.023 (+0.584)
	17	0.236 (5.99)	+0.028 (+0.711)
	13.5	0.296 (7.52)	+0.036 (+0.914)
	11	0.363 (9.22)	+0.044 (+1.118)
4	21	0.214 (5.44)	+0.026 (+0.660)
	19	0.237 (6.02)	+0.028 (+0.711)
	17	0.265 (6.73)	+0.032 (+0.813)
	13.5	0.333 (8.46)	+0.040 (+1.016)
	11.5	0.391 (9.93)	+0.047 (+1.194)
	11.0	0.409 (10.39)	+0.049 (+1.246)
	9.33	0.482 (12.24)	+0.058 (+1.473)
5	21.6	0.258 (6.55)	+0.031 (+0.787)
	21	0.265 (6.73)	+0.032 (+0.813)
	17	0.327 (8.31)	+0.039 (+0.991)
	13.5	0.412 (10.46)	+0.050 (+1.270)
	11	0.506 (12.85)	+0.061 (+1.549)
6	32.5	0.204 (5.18)	+0.024 (+0.610)
	26	0.255 (6.48)	+0.031 (+0.787)
	23.7	0.280 (7.11)	+0.034 (+0.864)
	21	0.315 (8.00)	+0.038 (+0.965)
	17	0.390 (9.91)	+0.047 (+1.194)
	13.5	0.491 (12.47)	+0.059 (+1.499)

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TABLE 3 *Continued*

Nominal Pipe Size (IPS)	DR[C]	Minimum	Tolerance
	11.5	0.576 (14.63)	+0.069 (+1.753)
	11.0	0.602 (15.29)	+0.072 (+1.829)
8	32.5	0.265 (6.73)	+0.032 (+0.813)
	26	0.332 (8.43)	+0.040 (+1.016)
	21	0.411 (10.44)	+0.049 (+1.245)
	17	0.507 (12.90)	+0.061 (+1.549)
	13.5	0.639 (16.23)	+0.077 (+1.956)
	11.5	0.750 (19.05)	+0.090 (+2.286)
	11	0.784 (19.91)	+0.094 (+2.388)
10	32.5	0.331 (8.41)	+0.040 (+1.016)
	26	0.413 (10.49)	+0.050 (+1.270)
	21	0.512 (13.00)	+0.061 (+1.549)
	17	0.632 (16.05)	+0.076 (+1.930)
	13.5	0.796 (20.22)	+0.096 (+2.438)
	11.5	0.935 (23.75)	+0.112 (+2.845)
	11	0.977 (24.82)	+0.117 (+2.972)
12	32.5	0.392 (9.96)	+0.047 (+1.194)
	26	0.490 (12.45)	+0.059 (+1.499)
	21	0.607 (15.42)	+0.073 (+1.854)
	17	0.750 (19.05)	+0.090 (+2.286)
	13.5	0.944 (23.98)	+0.113 (+2.870)
	11.5	1.109 (28.17)	+0.133 (+3.378)
	11	1.159 (29.44)	+0.139 (+3.531)

[A] The sizes listed in Table 3 are those commercially available sizes used by the gas industry.

[B] The minimum is the lowest wall thickness of the pipe at any cross section. The maximum permitted wall thickness, at any cross section, is the minimum wall thickness plus the stated tolerance. All tolerances are on the plus side of the minimum requirement.

[C] The DR shown are designations commonly accepted by the gas industry and do not calculate exactly.

[D] These wall thicknesses are minimum and are not a function of the dimension ratios.

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TABLE 4 Pipe Category

Property	Test Method	Category							
		A	B	C	D	E	F	G	H
Temperature, °F (°C)	. . .	100 (38)	120 (49)	140 (60)	160 (71)	180 (82)	200 (93)	. . .	...
Hydrostatic Design Basis, psi (MPa)	D 2837	400 (2.8)	500 (3.4)	630 (4.3)	800 (5.5)	1000 (6.9)	1250 (8.6)	1600 (11.0)	2000 (13.8)
Melt Index[A]	D 1238	>0.5	0.2–0.5	0.01–0.3	<0.01[B]	[C]	. . .	. . .	...
Examples: CDB - At 140ºF (60ºC) the HDB is 800 psi (5.5 MPa). The approximate melt index range is 0.2 to 0.5 g/10 min for this PE pipe. DF - At 160ºF (71ºC) the HDB is 1250 psi (8.6 MPa)[A].									

[A] The Melt Index information in this table is intended to provide guidance relating to heat fusion joining of PE materials, not for classification of materials. This property is not applicable to non-PE materials or to mechanical fittings. See 7.3.

[B] Typically melt flow measured under condition 190/21.6 is less than 4.01 g/10 min.

[C] When a PE pipe or fitting is marked per 7.2 or 7.3 with the letter "E", it affirms that the manufacturer has verified the applicability of generic fusion joining with their products in accordance with PPI TR-33 and PPI TR-41 by joining to itself and to other "E" materials and testing the joints in accordance with applicable regulations. However, qualification of joining procedures by operators in accordance with applicable regulations may still be required. Information about manufacturers who have verified PPI TR-33 and PPI TR-41 generic fusion joining with their products is found in PPI TR-33 and PPI TR-41. Consult PPI and the manufacturer for additional information.

5.7 *Minimum Hydrostatic Burst Pressure* —The burst requirements for plastic pipe shall be as given in the appropriate annexes.

5.8 *Apparent Tensile Strength At Yield*— The minimum apparent tensile strengths at yield for plastic pipe are given in the annexes when determined in accordance with 6.8.

5.9 *Joints*:

5.9.1 *Solvent Cemented*—Joints of solvent cementable pipe and fittings shall be made in accordance with the user's written procedure.

5.9.2 *Heat Fusion*:

5.9.2.1 Heat fusion joints of thermoplastic pipe and fittings shall be made in accordance with Practice D 2657and the user's written procedure.

5.9.2.2 PE butt fusion joining shall be between components (pipes, fittings, or valves) having the same SDR or DR. Butt fusion between unlike SDR or DR components shall be allowed only if it has been demonstrated that long term performance is not adversely affected. The minimum requirement to demonstrate long term performance shall be the validation procedure for PE in Test Method D 2837. The Hydrostatic Design Basis (HDB) of the PE material shall be validated using specimens containing butt fusion joints resulting from different SDRs or DRs. Pipe/pipe joints of the given PE material that pass shall validate pipe/pipe,

pipe/fitting, or fitting/fitting joints of the same SDR ratio for that PE material.

5.9.3 *Mechanical*—Mechanical fittings shall be installed in accordance with the user's written procedures and the fitting manufacturer's installation instructions. The joint shall be tested in accordance with the specific design category as outlined in 6.10.

5.10 *Plastic Valves*—All plastic gas valves shall meet the requirements of ANSI Standard B 16.40.

5.11 *Excess Flow Valves*—All excess flow valves shall meet the requirements of Specification F 2138.

6. Test Methods

6.1 *General*—The test methods in this specification cover plastic pipe and fittings to be used for gas distribution. Test methods that are applicable from other specifications will be referenced in the paragraph pertaining to that particular test.

6.2 *Sampling*—Take a representative sample of the pipe and fittings sufficient to determine conformance with this specification. About 40 ft (12 m) of pipe is required to perform all the tests prescribed. The number of fittings required varies, depending upon the size and type of fitting. A sampling plan shall be agreed upon by the purchaser and the manufacturer (see Practice D 1898).

6.2.1 *Pipe Test Specimens*—Not less than 50 % of the test specimens required for any pressure test shall have at least a part of the marking in their central sections. The central section is that portion of pipe which is at least one pipe diameter away from an end closure.

6.3 *Conditioning*—Unless otherwise specified, condition the specimens prior to test at 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity for not less than 40 h, in accordance with Procedure A of Practice D 618for those tests where conditioning is required and in all cases of disagreement.

6.4 *Test Conditions*—Conduct the test in the standard laboratory atmosphere of 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity, unless otherwise specified.

6.5 *Dimensions and Tolerances*:

6.5.1 *Pipe*—Any length of pipe is used to determine the dimensions. Coiled pipe shall be measured in the natural springback condition, unless specified otherwise.

6.5.1.1 *Diameter*—Measure the diameter of the pipe in accordance with Test Method D 2122. The average outside diameter for nonroundable pipe is the arithmetic average of the maximum and minimum diameters at any cross section on the length of the pipe. For roundable pipe, out-of-roundness tolerance applies to measurements made while the pipe is rounded with the manufacturer's recommended equipment. Measure out-of-roundness within one-half pipe diameter or 2 in. (50 mm), whichever is closer, of the rounding equipment. See Test Method D 2122for definitions of nonroundable and roundable pipe.

(1) The pipe surface shall be free of gross imperfections such as, deep scratches, grooves, or high or low (flat) spots around the pipe circumference.

NOTE 7—Excessive out-of-roundness may be caused by manufacturing irregularities around the circumference of the pipe, such as deep scratches, gouges, flat spots, and high spots. Such defects could detrimentally affect joining. To simulate field joining of roundable pipe, out-of-roundness is checked by fitting a rounding device on the pipe, then measuring diameter.

6.5.1.2 *Wall Thickness*—Make a minimum of six measurements at each cross section in accordance with Test Method D 2122.

6.5.1.3 *Wall Thickness Eccentricity Range*— Measure in a manner such that the maximum, *A*, and the minimum, *B*, wall thickness at single points of each cross section measured are obtained. Calculate the wall thickness eccentricity range, *E*, in percent for each cross section as follows:

$$E = [(A - B)/A] \times 100 \quad (1)$$

6.5.1.4 *Length*—Measure pipe length and other linear dimensions with a steel tape or other device, accurate to ±1/32 in. (±1 mm) in 10 ft (3 m).

6.5.2 *Fittings*—Measure the dimensions of fittings in accordance with Test Method D 2122.

6.5.3 *Ovality*:

6.5.3.1 *Apparatus*—A micrometer or vernier caliper accurate to within ±0.001 in. (±0.02 mm).

6.5.3.2 *Procedure*—Take a series of outside diameter (OD) measurements at closely spaced intervals around the circumference to ensure that the minimum and maximum diameters have been determined.

6.5.3.3 *Calculation*—Calculate the percent ovality as follows:

$$\%\ \text{ovality} = \frac{\text{maximum OD} - \text{minimum OD}}{\text{minimum OD} + \text{maximum OD}} \times 200 \quad (2)$$

6.6 *Sustained Pressure Test*:

6.6.1 Select six test specimens of pipe or fittings at random, condition at the standard laboratory test temperature and humidity, and pressure test in accordance with Test Method D 1598.

6.6.1.1 Test specimens shall be prepared so that the minimum length of pipe on each side of the fitting is equal to 5 times the diameter of the pipe but in no case less than 12 in. (304 mm) for sizes less than 6 in. For sizes 6 in. and larger, the minimum length shall be equal to 3 times the diameter or 30 in. (762 mm), whichever is shorter.

6.6.1.2 Pressures used shall be as shown in the annexes or as calculated (using the pipe's actual measured minimum wall thickness, outside diameter, and the applicable fiber stress shown in the annexes), whichever is greater. Piping intended for use at temperatures of 100°F (38°C) and higher shall be tested at both 73°F (23°C) and the maximum design temperature. The test fiber

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stress shall be the hydrostatic design basis (HDB) or 80 % of the 100 000-h intercept of the material, whichever is greater.

NOTE 8—Air, methane, or nitrogen may be substituted for water as the test medium.

6.6.2 Maintain the specimens at the pressures required, held to ±10 psi (0.07 MPa), for a period of 1000 h at the test temperature ±3.6°F (±2°C) as specified in 6.6.1.

6.6.3 Failure of two of the six specimens tested shall constitute failure in the test. Failure of one of the six specimens tested is cause for retest of six additional specimens. Failure of one of the six specimens in retest shall constitute failure in the test. Evidence of failure of the pipe shall be as defined in Test Method D 1598.

6.7 *Minimum Hydrostatic Burst Pressure (Quick Burst)* —The test equipment, procedures, and failure definitions shall be as specified in Test Method D 1599and the annexes. Pressures shall be as shown in the Annexes or as calculated (using the pipe's actual measured minimum wall thickness, outside diameter, and the applicable fiber stress), whichever is greater.

6.8 *Apparent Tensile Properties*—The procedure and test equipment shall be as specified inTest Method D 2290, Procedure B. The speed of testing shall be 0.5 in. (12.7 mm)/min. Cut "ring" specimens from pipe. They shall be ½-in. (12.7 mm) wide with a ¼-in. (6.3-mm) wide reduced section. Test a minimum of five specimens. This method is applicable to all pipe of nominal ¾-in. (19.0-mm) outside diameter and larger.

6.9 *Chemical Resistance*—Determine the resistance to the following chemicals in accordance with Test Method D 543. Where available, the test specimen shall be a ring 2 in. SDR 11 pipe cut to the ring dimensions specified in 6.8. For materials that are not readily available as 2 in. SDR 11 pipe, the test specimen shall be a plaque of material ¼ by 2 by 4 in. (6.3 by 50.8 by 101.6 mm) with a 1 in. (25.4 mm) wide reduced section.

Chemicals	Concentration (% by volume)
Mineral oil (USP)	100
Tertiary-butyl mercaptan	5 in mineral oil
Antifreeze agents (at least one shall be used):	
Methanol, or	100
Ethylene glycol	100
Toluene	15 in methanol

Test five specimens with each chemical. Weigh the specimens to the nearest 0.005 g and completely immerse them in the chemicals for 72 h. On removal from the chemicals, wipe the specimens with a clean dry cloth. Condition in air for 2 to 2¼ h and reweigh. Calculate the increase in weight to the nearest 0.01 % on the basis of initial weight. Test the specimen in tension in accordance with 6.8 within ½ h after weighing. Examine the weight and apparent tensile strength of each specimen for conformance to the requirement in 5.4. (**Warning—**Because of the possible toxicity of these reagents, refer to the Material Safety Data Sheet on each of these reagents before using or handling them.)

6.10 *Categorization of Mechanical Joints*—The following test methods provide a uniform procedure for qualification or categorization of mechanical joints using short term pullout resistance tests and burst tests. The mechanical joint categories and test methods are as follows:

6.10.1 *Category 1*—A mechanical joint design that provides a seal plus a resistance to a force on the pipe end equal to or greater than that which will cause a permanent deformation of the pipe.

6.10.1.1 The apparatus and report shall be as specified in Test Method D 638. The test shall be conducted at ambient temperatures, that is, 67 ± 10°F (19.4 ± 5.6°C). The speed of the testing shall be 0.2 in. (5 mm)/min ±25 %. Five specimens shall be prepared following the manufacturer's published installation instructions. Length of the specimens shall be such that the unreinforced distance between the grip of the apparatus and the end of the stiffener is at least five times the nominal outside diameter of the pipe size being tested. Apply a load until permanent deformation (yield) occurs in the unreinforced area of the piping.

6.10.1.2 Results obtained from the above method pertain only to the specific outside diameter, wall thickness, and compound of the piping used in the test and specific fitting design tested.

NOTE 9—The ability to restrain pipe to its yield as specified above does not guarantee that a properly installed joint will prevent pullout under actual long-term field conditions. Joints that cannot pass this test would be expected to pullout under actual long term field conditions. To date, this test is the best available for disqualifying unsound joints.

6.10.2 *Category 2*—A mechanical joint design that provides a seal only (see Appendix X2.5.5). A mechanical joint designed for this category excludes any provisions in the design or installation of the joint to resist any axial pullout forces; therefore, tensile tests are not required.

6.10.2.1 The test assembly shall meet the burst test requirements of 5.7 when tested in accordance with Test Method D 1599 with end closures designed in accordance with Test Method D 1599.

6.10.3 *Category 3*—A mechanical joint design that provides a seal plus a pipe restraint rating equivalent to the anticipated thermal stresses occurring in a pipeline (see Appendix X2.4). This category has a manufacturer's rated pipe end restraint less than the value required to yield the pipe as outlined in 6.10.1 (Category 1).

6.10.3.1 The procedures and testing shall be the same as outlined in 6.10.1 (Category 1) except the test tensile values shall meet the rated values published by the mechanical fitting manufacturer.

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7. Marking

7.1 *Pipe*—All required marking shall be legible, visible, and permanent. To ensure permanence, marking shall be applied so it can only be removed by physically removing part of the pipe wall. The marking shall (1) not reduce the wall thickness to less than the minimum value for the pipe, (2) not have any effect on the long-term strength of the pipe, and (3) not provide leakage channels when elastomeric gasket compression fittings are used to make the joints. These marking shall consist of the word GAS, the designation ASTM D 2513, the manufacturer's name or trademark, the ~~nominal~~normal pipe size including the sizing system used (IPS, CTS, or OD), DR or minimum wall thickness, material designation, and date of manufacture.

NOTE~~10—PE material designations PE2406 and PE3408 were included in earlier editions of Specification D2513. Changes to Specification D3350 led to changes in the PE material designation codes that resulted in the PE material designations PE2406 and PE3408 being supercededby newer material designations. Currently 49 CFR 192 references specification D2513–99 and as a result requires marking with material designation codes that are no longer included in this specification. For these reasons two material designations may be present on the print line. For example, PE2708 pipes were previously described as PE2406 pipes and may be marked as both PE2406 and PE2708.~~

~~7.1.1In addition to~~ 10—Earlier editions of Specification D 2513 included PE material designations PE2406 and PE3408. Changes to Specification D 3350 led to changes in the PE material designation codes that resulted in the PE material designations PE2406 and PE3408 being superceded by newer material designations. Additionally, 49 CFR 192 may not reference the most current version of D 2513 and as a result may require marking with material designation codes that are no longer included in this Specification. For these reasons two material designations may be present. For example, PE4710 pipes were previously described as PE3408 pipes and may be marked PE3408/4710. Similarly PE2708 pipes were previously described as PE2406 pipes and may be marked PE2406/2708.

7.1.1 In addition to 7.1, the pipe marking shall include a coding that will enable the manufacturer to determine the location of manufacture, pipe production and resin lots, and any additional information which is agreed upon between the manufacturer and purchaser. The manufacturer shall maintain such records for fifty years or for the design service life of the pipe, whichever is longer.

7.1.2 All the markings in 7.1 and 7.1.1 shall be repeated at intervals not exceeding 2 ft (0.61 m). For indented printing, either the indented print line shall be in a color that contrasts with that of the pipe, or a separate print line shall be in a color that contrasts with the pipe. See Annex A1 and Annex A2 for additional specific marking requirements. When color is applied to identify gas service, such as with color stripes, a color shell or solid color pipe, yellow color shall be used.

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NOTE 11—Using color to identify piping service is not mandatory, but if used, yellow color is required.

7.2 Pipe intended for natural gas service at elevated temperatures greater than 73°F (23°C) shall be marked with additional code letters from Table 4 (the first code letter to identify the temperature of pressure rating, the second code letter to identify HDB at highest rated temperature, and the third code letter to identify the melt index).

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NOTE 12—The non-mandatory, preferred order for all the items required in the print line in the marking sections 7.1 and 7.2 are:
(1) Pipe size including sizing system (IPS, CTS or OD),
(2) SDR (DR) or minimum wall thickness,
(3) Manufacturer's name or trademark,
(4) GAS,
(5) Pipe material designation code,
(6) Elevated temperature code from Table 4,
(7) ASTM D 2513,
(8) Manufacturer's lot code (includes date of manufacture in some cases), and
(9) Additional information, including date of manufacture, coil number, sequential footage, third party certification mark etc.
Example: 2 in. IPS SDR 11 MANUFACTURER NAME GAS PE 2708 CEC ASTM D 2513 LOT CODE INFO 02JAN98 coil #506.

7.3 *Fittings*—Fittings shall be marked D 2513, as well as with the applicable fitting specification. All fittings shall be marked on the body or hub. The markings shall consist at least of the manufacturer's name or trademark, or both, the size, the symbol for the type of material, and the three-letter code from Table 4 (as described in Section 7.2). In addition, the fittings markings shall include code that will enable the manufacturer to determine the date of manufacture, the location of manufacture, fitting production and resin lots, and any additional information which may be agreed upon between the manufacturer and purchaser. The manufacturer shall maintain such records for 50 years or for the design service life of the fittings, whichever is longer.

NOTE 13—Section 7.3 is applicable to fusion type fittings only. The marking requirements in Section 7.3 are not applicable to mechanical fittings.

8. Quality Assurance

8.1 When the product is marked with this designation, D 2513, the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with this specification and has been found to meet the requirements of this specification.

SUPPLEMENTARY REQUIREMENTS

GOVERNMENT/MILITARY PROCUREMENT

These requirements apply only to federal/military procurement, not domestic sales or transfers.

S1. *Responsibility for Inspection*—Unless otherwise specified in the contract or purchase order, the producer is responsible for performance of all inspection and test requirements specified herein. The producer shall use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless the purchaser disapproves. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that material conforms to prescribed requirements.

NOTE S00001—In U.S. federal contracts, the contractor is responsible for inspection.

S2. *Packaging and Marking for U.S. Government Procurement:*

S2.1 *Packaging*—Unless otherwise specified in the contract, the materials shall be packaged in accordance with the supplier's standard practices in a manner ensuring arrival at destination in satisfactory condition and which will be acceptable to the carrier at lowest rates. Containers and packing shall comply with Uniform Freight Classification rules or National Motor Freight Classification rules.

S2.2 *Marking*—Marking for shipment shall be in accordance with Fed. Std. No. 123 for civil agencies and MIL-STD 129 for military agencies.

NOTE S00002—The inclusion of U.S. Government procurement requirements should not be construed as an indication that the U.S. Government uses or endorses the products described in this specification.

ANNEXES

(Mandatory Information)

A1. SUPPLEMENTAL REQUIREMENTS FOR GAS PRESSURE PIPE AND FITTINGS PRODUCED FROM POLYETHYLENE (PE) MATERIAL

A1.1 Scope

A1.1.1 This annex covers requirements for PE pipe and fittings. These requirements are in addition to those in the main body of this specification.

NOTE A1.1—Because Table 1, which covers nominal pipe sizes up to 12 in. is in the body of this specification, and Table A1.1 is in Annex A1, the user should be aware of the larger tolerance allowed the larger pipe.

A1.2 Referenced Documents

A1.2.1 *ASTM Standards*: [2]

A1.2.1.1 *Test Methods for*:

D 1238 Melt Flow Rate of Thermoplastics by Extrusion Plastometer

A1.2.1.2 *Specification for*:

D 1248 Polyethylene Plastics Extrusion Materials for Wire and Cable

D 2683 Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

D 3350 Polyethylene Plastic Pipe and Fittings Materials

F 1055 Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

TABLE A1.1 Outside Diameters and Tolerances, 14 in. and Larger Pipe

Nominal Pipe Size	Actual Outside Diameters, in. (mm)	
	Average	Tolerance
14	14.000 (355.6)	±0.063 (±1.60)
16	16.000 (406.4)	±0.072 (±1.83)
18	18.000 (457.2)	±0.081 (±2.06)
20	20.000 (508.0)	±0.090 (±2.29)
22	22.000 (558.8)	±0.099 (±2.51)
24	24.000 (609.6)	±0.108 (±2.74)

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