~~Designation:F2785–09ε1~~ Designation: F2785 – 10

An American National Standard

Standard Specification for Polyamide 12 Gas Pressure Pipe, Tubing, and Fittings[1]

This standard is issued under the fixed designation F2785; 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.

~~ε[1] NOTE—Table 1 was editorially revised in March 2010.~~

1. Scope

1.1 This specification covers requirements and test methods for the characterization of polyamide 12 pipe, tubing, and fittings for use in fuel gas mains and services for direct burial and reliner applications. The pipe and fittings covered by this specification are intended for use in the distribution of natural gas.

1.1.1 This specification does not cover threaded pipe. Generic fusion guidelines are given in Appendix X1. Design considerations are discussed in Appendix X2. In-plant quality control programs are specified in Annex A1.

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 standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—Pipe and fittings utilizing heat fusion joining techniques produced from compounds meeting the requirements of Group 3, Class 2, and Grade 3 (PA323 or PA11) are intended for use with pipe manufactured from compounds meeting the requirements of Group 3, class 2 and Grade 3. Pipe and fittings utilizing heat fusion joining techniques produced from compounds meeting the requirements of Group 4, Class 2 and Grade 3 (PA 423 or PA12) are intended for use with pipe manufactured from compounds meeting the requirements of Group 4, Class 2 and Grade 3. As per the recommendations of the respective resin manufacturers, no cross fusion between PA 323 (PA11) and PA 423 (PA12) compounds is permitted.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents
D618 Practice for Conditioning Plastics for Testing
D648 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
D638 Test Method for Tensile Properties of Plastics
D789 Test Methods for Determination of Solution Viscosities of Polyamide (PA)
D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
D1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
D1898 Practice for Sampling of Plastics[3]
D1600 Terminology for Abbreviated Terms Relating to Plastics
D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
D2774 Practice for Underground Installation of Thermoplastic Pressure Piping
D2290 Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe by Split Disk Method
D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

[1] This test method is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.60 on Gas.
~~Current edition approved Aug. 1, 2009. Published September 2009. DOI: 10.1520/F2785-09E01.~~
Current edition approved Oct. 1, 2010. Published November 2010. Originally approved in 2009 as F2785–09. Last previous edition approved in 2009 as F2785—09ε1 DOI: 10.1520/F2785-10.

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

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

D3418 Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry
D4066 Classification System for Nylon Injection and Extrusion Materials (PA)
D6779 Classification System for Polyamide Molding and Extrusion Materials (PA)
F412 Terminology Relating to Plastic Piping Systems
F1025 Guide for Selection and Use of Full-Encirclement-Type Band Clamps for Reinforcement or Repair of Punctures or Holes in Polyethylene Gas Pressure Pipe
F1473 Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
F1733 Specification for Butt Heat Fusion Polyamide(PA) Plastic Fitting for Polyamide(PA) Plastic Pipe and Tubing
F1973 Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems
F2138 Specification for Excess Flow Valves for Natural Gas Service
F2145 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
F2767 Specification for Electrofusion Type Polyamide-12 Fittings for Outside Diameter Controlled Polyamide-12 Pipe and Tubing for Gas Distribution

2.2 *ANSI Standards:*[4]
B 16.40 Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
B 31.8 Gas Transmission and Distribution Piping Systems

2.3 *Federal Specifications:*[5]
Fed. Std. No. 123 Marking for Shipment (Civil Agencies)
OPS Part 192 Title 49 ,Title 49 Code of Federal Regulations

2.4 *Military Standards:*[6]
MIL-STD-129 Marking for Shipment and Storage
MIL-STD-1235 (ORD) Single- and Multi-Level Continuous Sampling Procedures and Tables for Inspection by Attributes

2.5 ~~*ISO Standards:*~~ *ISO Standards:*[6]
307 Plastics -- Polyamides -- Determination of viscosity number
3146 Plastics -- Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods
1183 Plastics -- Methods for determining the density of non-cellular plastics -- Part 1: Immersion method, liquid pyknometer method and titration method
527–1 Plastics -- Determination of tensile properties -- Part 1: General principles
527–2 Plastics -- Determination of tensile properties -- Part 2: Test conditions for moulding and extrusion plastics
178 Plastics -- Determination of flexural properties
180/1A Plastics -- Determination of Izod impact strength
75–1 Plastics -- Determination of temperature of deflection under load -- Part 1: General test method
75–2 Plastics -- Determination of temperature of deflection under load -- Part 2: Plastics and ebonite
ISO 22621 Part 1 Plastics piping systems for the supply of gaseous fuels for maximum operating pressure up to and including 2 MPa (20 bar) – Polyamide (PA) : General

2.6 *Plastic Pipe Institute:*[7]
PPI TR3 Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe
PPI TR4 Hydrostatic Design Bases and Maximum Recommended Hydrostatic Design Stresses for Thermoplastic Piping Materials
PPI TN7 Nature of Hydrostatic Stress Rupture Curves

2.7 *Other Standards:*[8]
National Fire Protection Association: NFPA 58 , Storage and Handling Liquefied Petroleum Gases

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F412, and abbreviations are in accordance with Terminology D1600, unless otherwise specified.

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

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[5] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://www.dodssp.daps.mil.
[6] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.
[7] Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.
[8] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.

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

3.4 *Definitions of Terms Specific to This Standard:*

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

3.6 *rounding equipment*, *n*—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.

3.7 *standard thermoplastic material designated code*, *n*—the pipe material designation code shall consist of the abbreviation for the polyamide (PA) followed by Arabic numerals which describe the short term properties in accordance with Classifications D4066 or D6779, 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 letters and five figures for polyamide pipe materials. For example, PA 42316 is a grade of polyamide 12 with a 1600 psi design stress for water at 73.4°F (23°C). The hydrostatic design stresses for gas are not used in this designation code.

3.8 *thermoplastic pipe dimension ratio (DR)*, *n*—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.

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

4. Requirements for Materials

4.1 *General*—The polyamide material used to make pipe and fittings shall be virgin or reworked material (see 4.5) and shall have a Plastics Pipe Institute (PPI) long-term hydrostatic design stress and hydrostatic design basis rating as determined per PPI TR3 and PPI TR4.

4.2 *Classification*—Polyamide materials suitable for use in the manufacturing of pipe and fittings under this specification shall be classified in accordance with Classifications D4066 and D6779, as shown in Table 1.

4.3 *Short- and Long-Term Properties*—Polyamide pipe and fittings shall be made from a PA material which also satisfies the combinations of short- and long-term property requirements shown in Table 2.

4.4 *Resistance to Rapid Crack Propagation (RCP) for Materialsl*—The material classification (formulation) used in the manufacture of pipe and fittings under this specification shall be tested for resistance to failure by RCP in accordance with 6.7. The data obtained shall be made available upon request without limitations on disclosure, and shall not subsequently be subject to disclosure limitations when used by others. The values obtained are applicable to all pipes with the wall thickness of the pipe tested and all thinner wall pipes.

4.5 *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 fittings produced meet all the requirements of this specification.

4.6 *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 for Pipe and Fittings

5.1 *General*—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 3 or Table 4 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 3 or Table 4.

5.3.1.3 *Wall Thickness*—The wall thickness shall be as specified in Table 4 or Table 5 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 4 or Table 5.

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.

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

TABLE 1 Classifications D4066 and D6779 †

Classification			Designation
Classification	ASTM Test Method	ISO Test Method	Designation
PAPolyamide			
	12 nylon		
4 (group)			
4 (group)			
2 (class)			
3 (grade)			
2 (class)	Heat stabilized		
2 (class)	Polyamide		
	PA 12		
	Heat stabilized		
3 (grade)			
Relative viscosity, min		ISO 307	2.06
Relative viscosity, min	D789	ISO 307	2.06
or			211
Viscosity number, min.			
Melt point, °C	D789		170–195
Specification			
Melt point, °C	D3418	ISO 3146	170–185
Specific gravity			1.00–1.06
Specific gravity	D792	ISO 1183	1.00–1.06
Tensile strength, min,	D638		35 MPa
TestMethodPa			
Tensile strength, min,	D638	ISO 527–1 and	35
MPa		ISO 527–2	
Elongation (ultimate), min,		150 %	
Elongation (ultimate), min, %			
Flexural modulus, min,		1000 Mpa	
Test Method D638			
Flexural modulus, min,	ISO 527–1 and	150	
Test Method D638	ISO 527–2		
Charpyor Izod i mpact		25 resistance, min, J/MISO 178	1000
Flexural modulus, min,	D790	ISO 178	1000
MPa			
Deflection temperatu re,		35 min at 1.80/1A	2 Mpa
Izod impact resistance	D256	ISO 180/1A	25
or			
Charpy impact resistance			
min J/M			
Mois ture “asreceived”, %,	D789		0.10 max
Specification °C			
Deflection temperature,	D648	ISO 75–1 and	40.10 max
at 1.82 Mpa, min °C		ISO 75–2	

† This table was editorially revised in March 2010.

TABLE 2 Short and Long Term Property Requirements

PA Material Designation Code	Short-Term in Accordance with D4066 or D6779	Long-Term in Accordance with D2837
PA42316	PA423	HDB of 3150 psi for 73°F (23°C)

chosen as the limit for the amount contributed by manufacturing, packing, in-plant storage, and shipping.

(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.

TABLE 3 Outside Diameters and Tolerances for PA12 Pipe, in. (mm)

Nominal Pipe Size	Outside Diameter	Tolerance	Maximum out-of-roundness (SDR 13.5 SDR 11)
½	0.840 (21.3)	±0.004 (±0.102)	0.016(0.406)
¾	1.050 (26.7)	±0.004 (±0.102)	0.02(0.508)
1	1.315 (33.4)	±0.005 (±0.127)	0.02(0.508)
1¼	1.660 (42.1)	±0.005 (±0.127)	0.024(0.61)
2	2.375 (60.3)	±0.006 (±0.152)	0.024(0.61)
3	3.500 (88.9)	±0.008 (±0.203)	0.03(0.762)
4	4.500 (114.3)	±0.009 (±0.229)	0.03(0.762)
5	5.563 (141.3)	±0.010 (±0.254)	0.06(1.524)
6	6.625 (168.3)	±0.011 (±0.279)	0.07(1.778)
8	8.625 (219.1)	±0.013 (±0.330)	0.08(2.04)
10	10.750 (273.0)	±0.015 (±0.381)	0.1(2.5)
12	12.750 (323.8)	±0.017(±0.432)	0.1(2.5)

TABLE 4 Tubing Diameters, Wall Thicknesses, and Tolerances, in. (mm)

Nominal Tubing Size (CTS)	Outside Diameter	Tolerance	Maximum Wall Thickness	Wall Thickness Tolerance
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)	0.090 (2.27)	+0.009 (+0.23)
1	1.125 (28.6)	±0.005 (±0.13)	0.090 (2.27)	+0.012 (+0.31)
1	1.125 (28.6)	±0.005 (±0.13)	0.099 (2.51)	+0.011 (+0.28)
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)	0.090 (2.27)	+0.011 (+0.28)
1¼	1.375 (34.9)	±0.005 (±0.13)	0.121 (3.07)	+0.015 (+0.38)

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 3, Table 4or Table 5 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.

5.4 *Conditioning*—For those tests where conditioning is required, or unless otherwise specified, condition the specimens prior to testing for a minimum of 1 h in water or 4 h in air at 73.4 ± 3.6°F (23 ± 2°C) or in accordance with 6.3. The conditioning requirements of 6.3shall be used in all cases of disagreement.

5.5 *Slow Crack Growth Resistance*—PA 12 materials shall meet a slow crack growth resistance requirement of 500 hours when tested in accordance with 6.6.

5.6 *Resistance to Rapid Crack Propagation (RCP)*—Additional testing for resistance to RCP is required when the wall thickness of the pipe being produced in accordance with this standard exceeds that of the pipe used to establish the resistance to RCP. In these circumstances, additional testing for resistance to failure by RCP in accordance with 6.7 shall be conducted. The data obtained shall be made available upon request without limitations on disclosure, and shall not subsequently be subject to disclosure limitations when used by others.

NOTE 4—The requirements and testing for resistance to RCP do not provide information for all possible conditions of use. The user should consult with the manufacturer and other appropriate sources such as resin suppliers, research, academia, etc., to determine that the RCP resistance provided by the pipe producer is sufficient for the intended use.

5.7 *Minimum Hydrostatic Burst Pressure/Apparent Tensile Strength (Quick Burst)*—The pipe or system shall fail in a ductile manner when tested in accordance with Test Method D1599 at a hoop stress greater than 3900 psi (27 MPa). For pipe sizes above 4-in. nominal diameter, the testing laboratory shall be allowed to replace the quick burst test (Test Method D1599) by the apparent ring tensile strength test (Test Method D2290). The minimum apparent tensile strength at yield when determined in accordance with 6.10 shall be 3900 psi (27 MPa).

5.8 *Sustained Pressure at 73°F (23°C)*—The pipe or system shall not fail in less than 1000 h when tested in accordance with Test Method D1598. The hoop stress shall be 2800 psi (19 MPa).

5.9 *Outdoor Storage Stability*—PA 12 pipe stored outdoors and unprotected for at least two years from date of manufacture shall meet all the requirements of this specification. PA 12 pipe stored outdoors for over two years from date of manufacture is suitable for use if it meets the requirements of this specification.

5.10 *Chemical Resistance*—The weight, yield strength, and relative viscosity requirements for PA 12 pipe when measured in accordance with 6.11 are in Table 6.

5.11 *Elevated Temperature Service*—Polyamide 12 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 D2837. The 100 000-h intercept (long-term strength) shall be categorized in accordance with Table 7 and be listed as the "hydrostatic design basis of XXX psi at XXX °F (C°) for (compound name)."

TABLE 5 Wall Thickness and Tolerances for PA12 Pipe, in. (mm)[A,B]

Nominal Pipe Size (IPS)	DR[C]	Minimum	Tolerance
½	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)
1	Sch 40	0.113 (2.87)	+0.014 (+0.356)
	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	11	0.216 (5.49)	+0.026 (+0.660)
	9.33	0.255 (6.48)	+0.031 (+0.787)
3	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)
4	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)
6	17	0.390 (9.91)	+0.047 (+1.194)
	13.5	0.491 (12.47)	+0.059 (+1.499)
	11.5	0.576 (14.63)	+0.069 (+1.753)
	11.0	0.602 (15.29)	+0.072 (+1.829)
8	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	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	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 6 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.

TABLE 6 Chemical Resisitance

Chemical	Weight Change, Max%	Yield Strength Change, max%	Relative Viscosity, %
Mineral Oil	+0.5	–12	±3
Tertiary-butyl mercaptan (5 %)	+0.5	–12	±3
Methanol	+5	–35	±3
Ethylene glycol	+0.5	–12	±3
Toulene (15%)	+7	–40	±3

TABLE 7 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)	...	...	...
Hydrostatic Design Basis, psi (MPa)	D2837	400 (2.8)	500 (3.4)	630 (4.3)	800 (5.5)	1000 (6.9)	1250 (8.6)	1600 (11.0)	2000 (13.8)
Examples: EH – At 140°F the HDB is 2000 psi (13.8 MPa)									

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.

5.12 *Joints*: