~~Designation:F714–06a~~ Designation: F 714 – 08

An American National Standard

Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter[1]

This standard is issued under the fixed designation F 714; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers polyethylene (PE) pipe made in dimensions based on outside diameters of 90 mm (3.500 in.) and larger.

1.2 Three standard outside diameter sizing systems are detailed: one known as the ISO metric system, one known as the IPS system, and the other known as the DIPS system. See 5.2.5 for guidelines for special sizes.

1.3 The piping is intended for new construction and insertion renewal of old piping systems used for the transport of water, municipal sewage, domestic sewage, industrial process liquids, effluents, slurries, etc., in both pressure and nonpressure systems.

NOTE 1—The user should consult the manufacturer to ensure that any damage to the polyethylene pipe caused by the material being transported will not affect the service life beyond limits acceptable to the user.

1.4 All pipes produced under this specification are pressure-rated. See Appendix X5 for information on pressure rating.

NOTE 2—References and material descriptions for PE2406, PE3406, PE3408 and materials having a HDB of 1450 psi have been removed from Specification F 714 due to changes in Specification D 3350 and PPI TR-3. For removed designations, refer to previous editions of Specification F 714, Specification D 3350, PPI TR-3 and PPI TR-4. The removal of these materials does not affect pipelines that are in service. See Notes ~~8 and 9~~9 and 10.

1.5 This specification includes criteria for choice of raw material, together with performance requirements and test methods for determining conformance with the requirements.

1.6 Quality-control measures are to be taken by manufacturers. See Appendix X4 for general information on quality control.

1.7 In referee decisions, the SI units shall be used for metric-sized pipe and inch-pound units for pipe sized in the IPS system (ANSI B36.10) and DIPS system. In all cases, the values given in parentheses are provided for information only.

1.8 The following safety hazards caveat pertains only to the test methods 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.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

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 1600 Terminology for Abbreviated Terms Relating to Plastics
D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
D 2290 Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe by Split Disk Method
D 2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
D 2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
D 3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
F 412 Terminology Relating to Plastic Piping Systems
F 585 Practice for Insertion of Flexible Polyethylene Pipe Into Existing Sewers

2.2 *ANSI Standard:*

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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 F17.26 on Olefin Based Pipe.

Current edition approved ~~Dec.~~March 1, ~~2006.~~2008. Published ~~December 2006.~~March 2008. Originally approved in 1981. Last previous edition approved in 2006 as F 714 – 06a.

[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.

B36.10 Standard Dimensions of Steel Pipe (IPS)[3]

2.3 *ISO Standards:*

161 Thermoplastic Pipe for the Transport of Fluids - Nominal Outside Diameters and Nominal Pressures[4]

3607 Polyethylene Pipe: Tolerances on Outside Diameters and Wall Thicknesses[4]

4427 Polyethylene Pipes and Fittings for Water Supply Specification[4]

2.4 *Federal Standard:*

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[5]

2.5 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[5]

2.6 *Canadian Standard:*

CGSB 41 GP-25M Pipe, Polyethylene for the Transport of Liquids[6]

2.7 *NSF/ANSI Standards:*

Standard No. 14 for Plastic Piping Components and Related Materials[7]

Standard No. 61 for Drinking Water Systems Components—Health Effects[7]

2.8 *Other Documents:*

PPI TR-3 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[8]

PPI TR-4 HDB/SDB/PDB/MRS Listed Materials, PPI Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe[8]

3. Terminology

3.1 Unless otherwise specified, definitions are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *relation between dimension ratio, hydrostatic design stress, and hydrostatic pressure:*

$$P = \frac{2S}{(D_O/t) - 1}$$

where:

S = hydrostatic design stress, psi (or kPa or MPa),
P = pressure rating, psi (or kPa or MPa),
D_O = average outside diameter, in. (or mm),
t = minimum wall thickness, in. (or mm), and
D_O/t = dimension ratio.

3.2.2 *relations between hydrostatic design basis and hydrostatic design stress*—the hydrostatic design stress, *S*, is determined by multiplying the hydrostatic design basis (HDB) by a design factor, *DF* that has a value less than 1.0.

NOTE 3—Hydrostatic design stress (HDS) ratings for PE materials are in accordance with Test Method D 2837 and PPI TR-3 and are listed in PPI TR-4.

4. Materials

4.1 *Polyethylene Compound*—Polyethylene material compounds suitable for use in the manufacture of pipe under this specification shall meet Specification D 3350 and shall meet the Specification D 3350 classification and property requirements in Table 2, and shall have PPI TR-4 HDB and HDS listings at 73°F (23°C) and HDB listings 140°F (60°C) in accordance with Table 2. See S1.

4.2 *Color and Ultraviolet (UV) Stabilization*—Polyethylene material compounds shall meet Specification D 3350 code C or E. Code C material compounds shall have 2 to 3 percent carbon black. Code E material compounds shall be colored with UV stabilizer.

4.3 *Rework Material*—Clean polyethylene compound from the manufacturer's own pipe production that met 4.1 and 4.2 as virgin material is suitable for reextrusion into pipe, either alone or blended with new compound of the same cell classification or material designation. Pipe containing the rework material shall meet the material and product requirements of this specification.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org..
[4] Available from International Organization for Standardization (ISO), 1 rue de Varembé, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.
[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 Canadian Standards Association (CSA), 5060 Spectrum Way, Mississauga, ON L4W 5N6, Canada, http://www.csa.ca.
[7] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.
[8] ~~Available from Plastic Pipe Institute, Inc., (PPI), 105 Decker Court, Irving, TX 75062~~
[8] Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.

TABLE 1 Elevated Temperature Sustained Pressure Requirements for Water Pipe[A]

Tempera	PE, 2606, PE2706, PE2708, PE3608, PE3708, PE4608, PE4708			PE3710, PE4710	
~~Conditure~~	~~Stress~~	~~Minimum A~~	~~verage Hours Before Failure Hours~~	~~Test Pressure Hoop Stress[B] psi (kPa)[A]~~	~~Minimum Average Time Before Failure Hours~~
Condition	Test Temperature °F (°C)[A]	Test Pressure Hoop Stress[B] psi (kPa)[A]	Minimum Average Time Before Failure Hours	Test Pressure Hoop Stress[B] psi (kPa)[A]	Minimum Average Time Before Failure Hours
~~80 ± 2°C (176 ± 3.6°F)~~	~~4.60 ± 0.07 MPa (670 ± 10 psi)~~	~~670 (4620)~~	~~170 h~~	~~750 (5170)~~	~~200~~
1	176 (80)	670 (4620)	170	750 (5170)	200
~~80 ±2°C (176 ± 3.6°F)~~	~~4.00 ± 0.07 MPa (580 ± 10 psi)~~	~~650 (4480)~~	~~340~~	~~730 (5020)~~	~~400~~
2	176 (80)	650 (4480)	340	730 (5020)	400
~~3~~	~~10)~~	~~630 (4345)~~	~~510 h~~	~~705 (4870)~~	~~600~~
3	176 (80)	630 (4345)	510	705 (4870)	600
4	176 (80)	610 (4210)	680	685 (4715)	800
5	176 (80)	590 (4070)	850	660 (4565)	1000
6	176 (80)	580 (4000)	1000	640 (4415)	1200

[A]Test temperature tolerance ± 3.6ºF (+/- 2ºC). Test pressure tolerance ± 5 psi (±35 kPa); test pressure hoop stress values are rounded to the nearest 5 psi or 5 kPa. Note: Table 2 conditions are based on PE validation requirements per ~~e~~ PPI TR-3 with Condition 6 being 85% of Condition 1 test pressure hoop stress and six times greater minimum average time before failure. Conditions 2 through 5 are linear stress and ~~p~~ time interpolations be~~, e~~tween Conditions 1 and 6. The intent of multiple conditions is to maintain equivalent performance criteri~~n~~a, but provide for retest in the event of ductile failure. The test pressure hoop stress levels for Conditions 2-5 are linear interpolations for arbitrarily chosen time increments. An equivalent perfor~~d~~mance requirement, however, may be determined by arbitrarily choosing a test pressure hoop stre~~f~~ss between Conditions 1 and 6 and linearly interpo~~w~~lating the minimum average time before failure. For example for PE3710 and PE4710 material, at 670 psi test pressure hoop stress, the minimum average time before failure would be 927 hours (200 + (750 – 670) · ((1200 – 200) / (750 – 640)) = 927).

[B]Calculate internal test pressure in accordance with:

$$P = \frac{2S}{\left(\frac{D_o}{t} - 1\right)}$$

~~w~~Where:

P = test pressure, psig (~~M~~kPa)~~,~~

S = test pressure hoop stress, psi. (~~M~~kPa)~~,~~

D_o = measured ~~average~~ outside diameter, in. (mm)~~, and~~

t = measured minimum wall thickness, in~~.~~ (mm)~~.~~

TABLE 2 Specification D 3350 Classification and Properties for Polyethylene Pipe Materials

Physical Properties	Cell Classification Number or Property Value							
	PE2606	PE2706	PE2708	PE3608	PE3708	PE3710	PE4708	PE4710
Density	2	2	2	3	3	3	4	4
Melt index	3 or 4	3 or 4	3 or 4	4	4	4	4	4
Flexural modulus	≥4	≥4	≥4	≥4	≥4	≥4	≥4	≥5
Tensile strength	≥3	≥3	≥3	≥4	≥4	≥4	≥4	≥4
Slow crack growth resistance (F 1473)	6	7	7	6	7	7	7	7
Hydrostatic strength classification	3	3	3	4	4	4	4	4
Color and UV Stabilizer[A]	C or E	C or E	C or E	C or E	C or E	C or E	C or E	C or E
HDB at 140°F (60°C), PPI TR-4, psi (MPa)	[B]	[B]	[B]	[B]	[B]	[B]	[B]	[B]
HDS at 73°F (23°C); PPI TR-4, psi (MPa)	630 (4.34)	630 (4.34)	800 (5.52)	800 (5.52)	800 (5.52)	1000 (6.90)	800 (5.52)	1000 (6.90)

[A] See 4.2.
[B]Listing required; consult manufacturer for listed value

5. Requirements

5.1 *Workmanship*—The pipe shall be homogeneous throughout and essentially uniform in color, opacity, density, and other properties. The inside and outside surfaces shall be semimatte or glossy in appearance (depending on the type of plastic) and free of chalking, sticky, or tacky material. The surfaces shall be free of excessive bloom, that is, slight bloom is acceptable. The pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that may affect the wall integrity. Holes deliberately placed in perforated pipe are acceptable. Bloom or chalking may develop in pipe exposed to direct rays of the sun (ultraviolet radiant energy) for extended periods and, consequently, these requirements do not apply to pipe after extended exposure to direct rays of the sun.

5.2 *Dimensions and Tolerances*:

5.2.1 *Outside Diameters*—These shall be in accordance with Table 3 (SI units), Table 4 (inch-pound units) or Table 5 (inch-pound units) when measured in accordance with Test Method D 2122 at any point not closer than 300 mm (11.8 in.) to the cut end of a length of pipe. Conditioning to standard temperature without regard to relative humidity is required.

5.2.2 *Wall Thicknesses*—The minimum thicknesses shall be in accordance with Table 6, Table 7, or Table 8 when measured in accordance with Test Method D 2122. Conditioning to standard temperature without regard to relative humidity is required.

5.2.3 *Eccentricity*—The wall thickness variability as measured and calculated in accordance with Test Method D 2122 in any diametrical cross section of the pipe shall not exceed 12 %.

TABLE 3 Outside Diameters and Tolerances

ISO Sizing System (ISO 161/1)			
NominalPipe Size	Equivalent	Outside Diameter, D_o, mm	
mm	in.	min	max[A]
90	3.543	90	90.8
110	4.331	110	111.0
160	6.299	160	161.4
200	7.874	200	201.8
250	9.843	250	252.3
280	11.024	280	282.5
315	12.402	315	317.8
355	13.976	355	358.2
400	15.748	400	403.6
450	17.717	450	454.1
500	19.685	500	504.5
560	22.047	560	565.0
630	24.803	630	635.7
710	27.953	710	716.4
800	31.496	800	807.2
900	35.433	900	908.1
1000	39.370	1000	1009.0
1200	47.244	1200	1210.8
1400	55.118	1400	1412.6
1600	62.992	1600	1614.4

[A] As specified in ISO 3607.

TABLE 4 Outside Diameters and Tolerances IPS Sizing System (ANSI B36.10)

Nominal Pipe Size, in.	Equivalent, mm	Actual Outside Diameters, in.	
		Average	Tolerance ± in.
3	88.9	3.500	0.016
4	114.3	4.500	0.020
5[A]	136.5	5.375	0.025
5	141.3	5.563	0.025
6	168.3	6.625	0.030
7[A]	181.0	7.125	0.034
8	219.1	8.625	0.039
10	273.1	10.750	0.048
12	323.8	12.750	0.057
13[A]	339.7	13.375	0.060
14	355.6	14.000	0.063
16	406.4	16.000	0.072
18	457.2	18.000	0.081
20	508.0	20.000	0.090
21.5[A]	546.1	21.500	0.097
22	558.8	22.000	0.099
24	609.6	24.000	0.108
26	660.4	26.000	0.117
28	711.2	28.000	0.126
30	762.0	30.000	0.135
32	812.8	32.000	0.144
34	863.6	34.000	0.153
36	914.4	36.000	0.162
42	1066.8	42.000	0.189
48	1219.2	48.000	0.216
54	1371.6	54.000	0.243

[A] Irregular size.

5.2.4 *Toe-In*—When measured in accordance with 5.2.1, 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 specifications in Table 3, Table 4, or Table 5.

5.2.5 *Special Sizes*—Where existing system conditions or special local requirements make other diameters or dimension ratios necessary, other sizes or dimension ratios, or both, shall be acceptable for engineered applications when mutually agreed upon by the customer and the manufacturer, if the pipe is manufactured from plastic compounds meeting the material requirements of this specification, and the strength and design requirements are calculated on the same basis as those used in this specification. For diameters not shown in Table 3, Table 4, or Table 5, the tolerance shall be the same percentage as that used in the corresponding

TABLE 5 Outside Diameters and Tolerances

DIPS Sizing System			
Nominal DIPS Sizes, in.	Equivalent, mm	Actual Outside Diameters, in.	
		Average	Tolerance ± in.
3	100.6	3.96	0.016
4	121.9	4.80	0.022
6	175.3	6.90	0.031
8	229.9	9.05	0.041
10	281.9	11.10	0.050
12	385.3	13.20	0.059
14	388.6	15.30	0.069
16	442.0	17.40	0.078
18	495.3	19.50	0.088
20	548.6	21.60	0.097
24	655.3	25.80	0.116
30	812.8	32.00	0.144
36	972.8	38.30	0.172
42	1130.3	44.50	0.200
48	1290.3	50.80	0.229

TABLE 6 Minimum Wall Thickness ISO 161 Sizing System, mm

DR Nominal Pipe Size	41	32.5	26	21	17	11
90	...	...	3.5	4.3	5.3	8.2
110	...	3.4	4.2	5.2	6.5	10.0
160	...	4.9	6.2	7.6	9.4	14.5
200	...	6.2	7.7	9.5	11.8	18.2
250	...	7.7	9.6	11.9	14.7	22.7
280	...	8.6	10.8	13.3	16.5	25.5
315	...	9.7	12.1	15.0	18.5	28.6
355	...	10.9	13.7	16.9	20.9	32.3
400	...	12.3	15.4	19.0	23.5	36.4
450	...	13.8	17.3	21.4	26.5	...
500	...	15.4	19.2	23.8	29.4	...
560	...	17.2	21.5	26.7	32.9	...
630	...	19.4	24.2	30.0	37.1	...
710	...	21.8	27.3	33.8	41.8	...
800	...	24.6	30.8	38.1	47.1	...
900	...	27.7	34.6	42.9	...	...
1000	24.4	30.8	38.5	47.6	...	...
1200	29.3	36.9	46.2	...	...	...
1400	34.1	43.1	...	...	...	...
1600	39.0	49.2	...	...	...	...

table for the next smaller listed size. Minimum wall thicknesses for DRs not shown in Table 6, Table 7, or Table 8 shall be determined by dividing the average outside diameter by the DR and rounding to three decimal places for inch sized pipes or two decimal places for metric sized pipes, and the tolerance shall comply with 5.2.3.

5.3 *Pressure Test Performance*—All pipe shall meet the requirements of 5.3.2 and either 5.3.1 or 5.4.

NOTE 4—The requirements of 5.3.1 and 5.3.2 are for laboratory proof-testing only and should not be interpreted as applicable to in situ testing for acceptance of installed systems. See appropriate installation and leak testing standards or manufacturer's recommendations for field testing procedure.

5.3.1 *Short-Term Pressurization*—Quick burst or non-failure testing shall be conducted per 5.3.1.1 or 5.3.1.2. Test pressure shall be determined per 3.2.1 except that *S* shall be the prescribed hoop stress value, and *P* shall be test pressure.

5.3.1.1 *Quick Burst*—For pipe nominal 12-in. (315 mm) and smaller diameter, rupture shall be ductile when tested in accordance with 6.1. The minimum hoop stress shall be 2500 psi for Table 2 density cell 2 materials and 2900 psi for Table 2 density cell 3 and 4 materials.

5.3.1.2 *Non-Failure*—When raised to test pressure and held at test pressure for five (5) seconds, pipe shall not rupture, leak, nor exhibit localized deformation when tested in accordance with 6.1 at a test pressure determined using 2500 psi hoop stress for Table 2 density cell 2 materials, and 3200 psi hoop stress for Table 2 density cell 3 and 4 materials.

5.3.2 *Elevated Temperature Sustained Pressure*~~—Test in accordance with~~ —Elevated-temperature sustained-pressure test for each Table 2 polyethylene pipe material (material designation) used in production at the facility shall be conducted per 6.2~~at one~~ .

TABLE 7 Minimum Wall Thickness
IPS Sizing System, in. (ANSI B36.10)

Nominal IPS Pipe Size	Actual Pipe Size	Dimension Ratio											
		41	32.5	26	21	17	15.5	13.5	11	9.3	9	8.3	7.3
3	3.500	0.085	0.108	0.135	0.167	0.206	0.226	0.259	0.318	0.376	0.389	0.422	0.479
4	4.500	0.110	0.138	0.173	0.214	0.265	0.290	0.333	0.409	0.484	0.500	0.542	0.616
5[A]	5.375	0.131	0.165	0.207	0.256	0.316	0.347	0.398	0.489	0.578	0.597	0.648	0.736
5	5.563	0.136	0.171	0.214	0.265	0.327	0.359	0.412	0.506	0.598	0.618	0.670	0.762
6	6.625	0.162	0.204	0.255	0.315	0.390	0.427	0.491	0.602	0.712	0.736	0.798	0.908
7[A]	7.125	0.174	0.219	0.274	0.340	0.420	0.460	0.528	0.648	0.766	0.792	0.858	0.976
8	8.625	0.210	0.265	0.332	0.411	0.507	0.556	0.639	0.784	0.927	0.958	1.039	1.182
10	10.750	0.262	0.331	0.413	0.512	0.632	0.694	0.796	0.977	1.156	1.194	1.295	1.473
12	12.750	0.310	0.392	0.490	0.607	0.750	0.823	0.944	1.159	1.371	1.417	1.536	1.747
13[A]	13.375	0.326	0.412	0.514	0.637	0.787	0.863	0.991	1.216	1.438	1.486	1.611	1.832
14	14.000	0.341	0.431	0.538	0.667	0.824	0.903	1.037	1.273	1.505	1.556	1.687	1.918
16	16.000	0.390	0.492	0.615	0.762	0.941	1.032	1.185	1.455	1.720	1.778	1.928	2.192
18	18.000	0.439	0.554	0.692	0.857	1.059	1.161	1.333	1.636	1.935	2.000	2.169	2.466
20	20.000	0.488	0.615	0.769	0.952	1.176	1.290	1.481	1.818	2.151	2.222	2.409	...
21.5[A]	21.500	0.524	0.662	0.827	1.024	1.265	1.387	1.593	...	...	...	...	...
22	22.000	0.537	0.677	0.846	1.048	1.294	1.419	1.630	2.000	2.366	2.444	...	...
24	24.000	0.585	0.738	0.923	1.143	1.412	1.548	1.778	2.182	2.581	2.667	...	...
26	26.000	0.634	0.800	1.000	1.238	1.529	1.677	1.926	2.364	2.796	...	...	...
28	28.000	0.683	0.862	1.077	1.333	1.647	1.806	2.074	2.545	3.011	...	...	...
30	30.000	0.732	0.923	1.154	1.429	1.765	1.935	2.222	2.727	3.226	...	...	...
32	32.000	0.780	0.985	1.231	1.524	1.882	2.065	2.370	2.909	...	...	...	...
34	34.000	0.829	1.046	1.308	1.619	2.000	2.194	2.519	3.091	...	...	...	...
36	36.000	0.878	1.108	1.385	1.714	2.118	2.323	2.667	3.273	...	...	...	...
42	42.000	1.024	1.292	1.615	2.000	2.471	2.710	...	...	...	...	...	...
48	48.000	1.171	1.477	1.846	2.286	2.824	3.097	...	...	...	...	...	...
54	54.000	1.317	1.662	2.077	2.571	3.176	...	...	...	...	...	...	...

[A] Irregular size.

TABLE 8 Minimum Wall Thickness

Nominal DIPS Pipe Size	Actual OD[A] Pipe Size	DIPS Sizing System, in. Dimension Ratio						
		41	32.5	26	21	17	13.5	11
3	3.96	...	0.122	0.153	0.189	0.233	0.294	0.360
4	4.80	0.117	0.148	0.185	0.229	0.283	0.356	0.437
6	6.90	0.168	0.213	0.266	0.329	0.406	0.512	0.628
8	9.05	0.221	0.279	0.348	0.431	0.533	0.670	0.823
10	11.10	0.236	0.342	0.427	0.529	0.653	0.823	1.009
12	13.20	0.322	0.407	0.508	0.629	0.777	0.978	1.200
14	15.30	0.373	0.471	0.589	0.729	0.900	1.134	1.391
16	17.40	0.424	0.536	0.670	0.829	1.024	1.289	1.582
18	19.50	0.463	0.600	0.750	0.929	1.147	1.445	1.773
20	21.60	0.527	0.665	0.831	1.029	1.271	1.600	1.964
24	25.80	0.629	0.794	0.993	1.229	1.518	1.912	2.346
30	32.00	0.780	0.985	1.231	1.524	1.883	2.371	2.909
36	38.30	0.934	1.179	1.473	1.824	2.253	2.837	3.482
42	44.50	1.085	1.370	1.712	2.119	2.618	3.297	4.046
48	50.80	1.239	1.563	1.954	2.419	2.989	3.763	4.619

[A] In accordance with Table 6.

NOTE 5—Elevated temperature sustained pressure tests are intended to verify extrusion processing and are conducted in accordance with the manufacture's quality program.

5.3.2.1 Passing results are *(1)* non-failure for all three specimens at a time equal to or greater than the Table 1 ~~temperature and stress condition for the specified minimum average time before failure. For ductile failure before the minimum time at a higher stress condition, repeat the test at the next lower stress condition. Ductile or non-ductile failure before the minimum time at the lowest stress condition constitutes failure to meet this requirement.~~ "minimum average time before failure", or *(2)* not more than one ductile specimen failure and the average time before failure for all three specimens shall be greater than the specified "minimum average time before failure" for the selected Table 1 Condition. If more than one ductile failure occurs before the Table 1 "minimum average time before failure", it is permissible to conduct one retest at a Table 1 Condition of lower stress and longer minimum average time before failure for the material designation except that for Table 1 Condition 6 no retest is permissible. Brittle failure of any specimen in the test sample when tested at Table 1 Condition 1 through 6 constitutes failure to meet this requirement and no retest is allowed.

5.3.2.2 *Provision for retest (if needed)*— The retest sample shall be three specimens of the same pipe or tubing size and material designation from the same time frame as the test sample per 6.2. For the retest, any specimen failure before the "minimum average