



# Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing<sup>1</sup>

This standard is issued under the fixed designation D 3261; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope

1.1 This specification covers polyethylene (PE) butt fusion fittings for use with polyethylene pipe (IPS and ISO) and tubing (CTS). Included are requirements for materials, workmanship, dimensions, marking, sustained pressure, and burst pressure.

1.2 The values given in parentheses are provided for information only.

## 2. Referenced Documents

### 2.1 ASTM Standards:

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure<sup>2</sup>

D 1599 Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings<sup>2</sup>

D 1600 Terminology for Abbreviated Terms Relating to Plastics<sup>3</sup>

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings<sup>2</sup>

D 2513 Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings<sup>2</sup>

D 3350 Specification for Polyethylene Plastics Pipe and Fittings Materials<sup>4</sup>

F 412 Terminology Relating to Plastic Piping Systems<sup>2</sup>

### 2.2 Federal Standard:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)<sup>5</sup>

### 2.3 Military Standard:

MIL-STD-129 Marking for Shipment and Storage<sup>5</sup>

### 2.4 National Sanitation Foundation Standard:

Standard No. 14 for Plastic Piping Components and Related Materials<sup>6</sup>

## 3. Terminology

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

3.2 *dimension ratio (DR) for thermoplastic pipe*—the ratio of diameter to wall thickness. For this specification it is calculated by dividing the specified outside diameter by the specified wall thickness of the fitting at its area of fusion. DRs are rounded and do not calculate exactly.

## 4. Classification

4.1 *General*—This specification covers butt fusion fittings intended for use with polyethylene pipe and tubing.

4.1.1 Fittings covered by this specification are normally molded. Fittings may be machined from extruded or molded stock.

4.1.2 Fittings fabricated by thermal welding are not included in this specification.

4.1.3 Fittings intended for use in the distribution of natural gas or petroleum fuels shall also meet the requirements of Specification D 2513.

## 5. Ordering Information

5.1 When ordering fittings under this specification, the following should be specified:

5.1.1 Polyethylene compound (material designation or trade name)

5.1.2 Style of fitting (tee, 90° ell, and the like)

5.1.3 Size:

5.1.3.1 Nominal diameter.

5.1.3.2 CTS, IPS, or schedule.

5.1.3.3 Dimension ratio number or schedule number.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.10 on Fittings. Current edition approved April 10, 2003. Published August 2003. Originally approved in 1973. Last previous edition approved in 1997 as D 3261 – 97.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 08.04.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 08.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 08.02.

<sup>5</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

<sup>6</sup> Available from the National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106.

**TABLE 1 Specification D 3350 Classification of Polyethylene Fittings Materials**

For HDB of	1250 psi (8.6 MPa)	1600 psi (11 MPa)
Physical Properties and Cell Classification Limits are:		
Density (base resin)	2	3
Melt Index	3 or 4	3 or 4
Flexural Modulus	4 to 5	4 or 5 or 6
Tensile Strength	3 or 4	3 or 4 or 6
SCG Resistance <sup>A</sup>	4 or 6	4 or 6
HDB	3	4
Color and UV Stabilizer	C or E	C or E

<sup>A</sup>In accordance with the requirements of Specification D 2513 a 6 is required when fittings are intended for use in the distribution of natural gas or petroleum fuels.

## 6. Materials

6.1 *Basic Materials*—This specification covers fittings made from polyethylene plastics as defined in Specification D 3350.

NOTE 1—The Plastics Pipe Institute has recommended a hydrostatic design stress of 630 psi (4.34 MPa) for pipe compounds designated as PE 2406 and 800 psi (5.51 MPa) for compounds designated as PE 3408.

6.2 *Rework Material*—Clean rework material generated from the manufacturer’s own production may be used by the same manufacturer as long as the fittings produced conform to the requirements of this specification.

## 7. Requirements

### 7.1 Dimensions and Tolerances:

7.1.1 *Outside Diameter*—Nominal outside diameters of butt fusion fittings shall conform to the nominal iron pipe size (IPS) or copper tubing size (CTS) dimensions at area of fusion. These dimensions and tolerances shall be as shown in Table 2 and Table 3 of this specification.

**TABLE 2 IPS Sizing System Outside Diameters and Tolerances for Fittings for Use with Polyethylene Pipe, in.**

Nominal Pipe Size	Average Outside Diameter at Area of Fusion <sup>A</sup>	Tolerance
1/2	0.840	±0.008
3/4	1.050	±0.008
1	1.315	±0.010
1 1/4	1.660	±0.010
1 1/2	1.900	±0.010
2	2.375	±0.010
3	3.500	±0.012
4	4.500	±0.015
6	6.625	±0.018
8	8.625	±0.025
10	10.750	±0.027
12	12.750	±0.036
14	14.000	±0.063
16	16.000	±0.072
18	18.000	±0.081
20	20.000	±0.090
21.5	21.500	±0.097
22	22.000	±0.099
24	24.000	±0.108
28	28.000	±0.126
32	32.000	±0.144
36	36.000	±0.162
42	42.000	±0.189
48	48.000	±0.216

<sup>A</sup> Defined as measured 1/4 to 1/2 in. (6.4 to 12.7 mm) from fitting outlet extremity.

**TABLE 3 ISO Sizing System (ISO 161/1) Outside Diameters and Tolerances for Fit for Use with Polyethylene Pipe, mm**

Nominal Pipe Size	Average Outside Diameter at Area of Fusion	
	Min	Max <sup>A</sup>
90	90.0	90.8
110	110.0	111.0
160	160.0	161.4
200	200.0	201.8
250	250.0	252.3
280	280.0	282.5
315	315.0	317.8
355	355.0	358.2
400	400.0	403.6
450	450.0	454.1
500	500.0	504.5
560	560.0	565.0
630	630.0	635.7
710	710.0	716.4
800	800.0	807.2
900	900.0	908.1
1000	1000.0	1009.0
1200	1200.0	1210.8
1400	1400.0	1412.6
1600	1600.0	1614.4

<sup>A</sup> Specified in ISO 3607.

7.1.2 *Inside Diameter (CTS Fittings Only)*—Inside diameters of butt fusion fittings for tubing at area of fusion shall conform to the dimensions of the tubing being joined. The dimensions and tolerances for the fittings are shown in Table 4.

7.1.3 *Wall Thickness*—The wall thicknesses of butt fusion fittings shall not be less than the minimum specified for the pipe or tubing. The wall thicknesses and tolerances at the area of fusion shall be as shown in Table 4, Table 5 and Table 6 of this specification.

7.1.4 *Measurements*—These shall be made in accordance with Test Method D 2122 for roundable pipe.

7.1.5 *Design Dimensions*—Overall fitting dimensions may be as preferred from a design standpoint by the manufacturer and accepted by the purchaser consistent with 7.1.3.

7.1.6 *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 fitting 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 2 or Table 3, the tolerance shall be the same percentage as that shown in the corresponding tables for the next smaller listed size. Minimum wall thickness for these special sizes shall not be less than the minimum wall specified for the pipe or tubing the fitting is designed to be used with. The maximum wall thickness allowed shall not be greater than 20 % thicker than the specified minimum wall, and shall be determined by 10.4.3 of this specification.

### 7.2 Pressure Test Requirements:

7.2.1 *Short-Term Rupture Strength for Fittings 1/2 to 12 in. and 90 to 315 mm, Nominal Diameter*—The minimum short-term rupture strength of the fitting and fused pipe or tubing shall not be less than the minimum short-term rupture strength of the pipe or tubing in the system when tested in accordance

**TABLE 4 Diameter, Wall Thickness, and Tolerances for Fittings for Use with Plastic Tubing**

Tubing Type in. (mm)	Nominal Tubing Size, in.	Diameter at Area of Fusion <sup>A</sup>				Minimum Wall Thickness, in. (mm)
		Outside, in. (mm)		Inside, in. (mm)		
		Average	Tolerance	Average	Tolerance	
0.062 (1.57)	½ CTS	0.625 (15.88)	±0.010 (±0.26)	0.495 (12.58)	±0.004 (±0.10)	0.062 (1.58)
	¾ CTS	0.875 (22.22)	±0.010 (±0.26)	0.745 (18.92)	...	...
0.090 (2.29)	½ CTS	0.625 (15.88)	±0.010 (±0.26)	0.437 (11.10)	±0.004 (±0.10)	0.090 (2.28)
	¾ CTS	0.875 (22.22)	±0.010 (±0.26)	0.687 (17.44)	±0.004 (±0.10)	0.090 (2.28)
DR 11	1 CTS	1.125 (28.58)	±0.013 (±0.34)	0.937 (23.80)	±0.005 (±0.12)	0.090 (2.28)
	1 ¼ CTS	1.375 (34.92)	±0.013 (±0.34)	1.187 (30.14)	±0.005 (±0.12)	0.090 (2.28)
	¾ CTS	0.875 (22.22)	±0.010 (±0.26)	0.715 (18.16)	±0.004 (±0.10)	0.077 (1.96)
	1 CTS	1.125 (28.58)	±0.013 (±0.34)	0.915 (23.24)	±0.005 (±0.12)	0.101 (2.56)
DR 9.3	1 ¼ CTS	1.375 (34.92)	±0.013 (±0.34)	1.125 (28.58)	±0.005 (±0.12)	0.121 (3.08)
	½ CTS	0.625 (15.88)	±0.010 (±0.26)	0.483 (12.26)	±0.004 (±0.10)	0.067 (1.70)
	¾ CTS	0.875 (22.22)	±0.010 (±0.26)	0.679 (17.24)	±0.004 (±0.10)	0.094 (2.38)
	1 CTS	1.125 (28.58)	±0.013 (±0.34)	0.873 (22.18)	±0.005 (±0.12)	0.121 (3.08)
	1 ¼ CTS	1.375 (34.92)	±0.013 (±0.34)	1.069 (27.16)	±0.005 (±0.12)	0.148 (3.76)

<sup>A</sup> Defined as measured ¼ to ½ in. (6.4 to 12.7 mm) from fitting outlet extremity.

**TABLE 5 IPS Sizing System Wall Thickness and Tolerance at the Area of Fusion for Fittings for Use with Polyethylene Pipe, in.<sup>A, B, C</sup>**

Nominal Pipe Size	Minimum Wall Thickness									
	SCH 40	SCH 80	SDR 21	SDR 17	SDR 13.5	DR 10	DR 11.5	SDR 11	DR 9.3	SDR 9
½	0.109	0.147	...	...	...	...	...	0.076	0.090	...
¾	0.113	0.154	...	...	...	...	...	0.095	0.113	0.117
1	0.133	0.179	...	...	...	...	...	0.119	0.142	0.146
1¼	0.140	0.191	...	...	...	0.166	...	0.151	0.179	0.184
1 ½	0.145	0.200	...	...	...	...	...	0.173	0.204	0.211
2	0.154	0.218	...	...	...	...	...	0.216	0.256	0.264
3	0.216	0.300	...	...	0.259	...	0.305	0.318	0.377	0.389
4	0.237	0.337	...	0.264	0.333	...	0.392	0.409	0.484	0.500
6	0.280	0.432	0.316	0.390	0.491	...	0.576	0.603	0.713	0.736
8	0.322	...	0.410	0.508	0.639	...	0.750	0.785	0.928	0.958
10	0.365	...	0.511	0.633	0.797	...	0.935	0.978	1.156	1.194
12	0.406	...	0.608	0.750	0.945	...	1.109	1.160	1.371	1.417
14	...	...	0.667	0.824	...	...	...	1.273	1.505	1.556
16	...	...	0.762	0.941	...	...	...	1.455	1.720	1.778
18	...	...	0.857	1.059	...	...	...	1.636	1.935	2.000
20	...	...	0.952	1.176	...	...	...	1.818	2.151	2.222
21.5	...	...	1.024	1.265	...	...	...	...	...	...
22	...	...	1.048	1.294	...	...	...	2.000	2.366	2.444
24	...	...	1.143	1.412	...	...	...	2.182	2.581	...
28	...	...	1.333	1.647	...	...	...	2.545	...	...
32	...	...	1.524	1.882	...	...	...	2.909	...	...
36	...	...	1.714	2.118	...	...	...	...	...	...
42	...	...	2.000	2.471	...	...	...	...	...	...
48	...	...	2.286	...	...	...	...	...	...	...

<sup>A</sup> Tolerance +20 %, -0 %.

<sup>B</sup> For those SDR groups having overlapping thickness requirements, a manufacturer may represent their product as applying to the combination (for example, 11.0/11.5) so long as their product falls within the dimensional requirements of both DR's.

<sup>C</sup> For wall thicknesses not listed the minimum wall thickness may be calculated by the average outside diameter/SDR rounded up to the nearest 0.001 in.

with 10.5.3. These minimum pressures shall be as shown in Table 7 of this specification. Test specimens shall be prepared for testing in the manner described in 10.5.1 of this specification. The test equipment, procedures, and failures definitions shall be as specified in Test Method D 1599.

**7.2.2 Short-Term Strength for Fittings 14 to 48 in. and 355 to 1600 mm, Nominal Diameter**—Fittings shall not fail when tested in accordance with 10.5.3. The minimum pressure shall be as shown in Table 7 of this specification. Test specimens shall be prepared for testing in the manner described in 10.2 of this specification. The test equipment and procedures shall be as specified in Test Method D 1599.

**7.2.3 Sustained Pressure**—The fitting and fused pipe or tubing shall not fail, as defined in Test Method D 1598, when tested at the time, pressures, and test temperatures selected

from test options offered in Table 8. The test specimens shall be prepared for testing in the manner prescribed in 10.5.1.

**8. Workmanship, Finish, and Appearance**

8.1 The manufacture of these fittings shall be in accordance with good commercial practice so as to produce fittings meeting the requirements of this specification. Fittings shall be homogeneous throughout and free of cracks, holes, foreign inclusions, or other injurious defects. The fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

**9. Sampling**

9.1 Parts made for sale under this specification should be sampled at a frequency appropriate for the end use intended.

**TABLE 6 ISO Sizing System Wall Thickness and Tolerance at the Area of Fusion for Fittings for Use with Polyethylene Pipe, mm<sup>A,B,C</sup>**

Nominal Pipe Size	Minimal Wall Thickness					
	DR 41	DR 32.5	DR 26	DR 21	DR 17	DR 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	...	...	...	...

<sup>A</sup> Tolerance +20 %, -0 %.

<sup>B</sup> For those SDR groups having overlapped thickness requirements, a manufacturer may represent their product as applying to the combination (for example, 11.0/11.5) so long as their product falls within the dimensional requirements of both DR's.

<sup>C</sup> For wall thicknesses not listed the minimum wall thickness may be calculated by the average outside diameter/SDR rounded up to the nearest 0.001.

**TABLE 7 Burst Pressure Requirements at 73.4°F for Common Fitting Sizes<sup>A</sup>**

Wall Thickness, DR, or Schedule	Nominal Diameter	Minimum Pressure, psi (MPa)
DR 7	ALL <sup>B</sup>	840 (5.793)
SDR 9	ALL <sup>B</sup>	630 (4.345)
DR 9.3	ALL <sup>B</sup>	610 (4.207)
SDR 11	ALL <sup>B</sup>	500 (3.448)
DR 11.5	ALL <sup>B</sup>	480 (3.310)
DR 15.5	ALL <sup>B</sup>	350 (2.414)
SDR 17	ALL <sup>B</sup>	320 (2.207)
SDR 21	ALL <sup>B</sup>	250 (1.724)
DR 26	ALL <sup>B</sup>	200 (1.390)
DR 32.5	ALL <sup>B</sup>	160 (1.103)
0.062 in. (1.575 mm)	½ CTS	555 (3.828)
0.062 in. (1.575 mm)	¾ CTS	380 (2.621)
0.062 in. (1.575 mm)	1 CTS	290 (2.000)
0.090 in. (2.286 mm)	½ CTS	850 (5.862)
0.090 in. (2.286 mm)	¾ CTS	580 (4.000)
0.090 in. (2.286 mm)	1 CTS	440 (3.034)
0.090 in. (2.286 mm)	1¼ CTS	350 (2.414)
SCH 40	½ IPS	750 (5.172)
SCH 40	¾ IPS	600 (4.138)
SCH 40	1 IPS	570 (3.931)
SCH 40	1 ¼ IPS	460 (3.172)
SCH 40	1 ½ IPS	420 (2.897)
SCH 40	2 IPS	350 (2.414)
SCH 40	3 IPS	330 (2.276)
SCH 40	4 IPS	280 (1.931)
SCH 40	6 IPS	220 (1.517)
SCH 40	8 IPS	200 (1.379)
SCH 40	10 IPS	180 (1.241)
SCH 40	12 IPS	170 (1.172)
SCH 40	16 IPS	165 (1.138)
SCH 40	20 IPS	155 (1.069)

<sup>A</sup> Fiber stress of 2520 psi (17.4 MPa) for PE2406 and PE3408.

<sup>B</sup> Refers to IPS and ISO diameters shown in Table 2 and Table 3.

When the fittings are to be installed under a system specification (such as Specification D 2513 for gas), the minimum requirements of that specification must be satisfied.

## 10. Test Methods

10.1 *General*—The test methods in this specification cover fittings to be used with pipe and tubing for gas, water, and other engineered piping systems. Test methods that are applicable from other specifications will be referenced in the paragraph pertaining to the particular test. Certain special test methods applicable to this specification only are explained in the appropriate paragraph.

10.2 *Conditioning*—Unless otherwise specified, condition the specimens prior to test at 73.4 ± 3.6°F (23 ± 2°C) for not less than 6 h in air, or 1 h in water, for those tests where conditioning is required and in all cases of disagreement. Newly molded fittings shall be conditioned 40 h prior to test.

10.3 *Test Conditions*—Conduct the tests at the standard laboratory temperature of 73.4 ± 3.6°F (23 ± 2°C) unless otherwise specified.

### 10.4 Dimensions and Tolerances:

10.4.1 *Outside Diameter*—Measure the outside diameter of the fittings at the area of fusion in accordance with the Wall Thickness section of Method D 2122 by use of a circumferential tape readable to the nearest 0.001 in. (0.02 mm).

10.4.2 *Inside Diameter (CTS Fittings Only)*—Use a stepped plug gage to determine the inside diameter of the CTS end of the fitting. The plug gage shall be of the go/no go type and shall have ½-in. (12.7-mm) land lengths cut to the minimum inside diameter and maximum inside diameter. A fitting is unaccept-

able (no go) if it fits snugly on the minimum inside diameter land of the gage or if it fits loosely on the maximum diameter land of the gage.

10.4.3 *Wall Thickness*—Make a series of measurements using a cylindrical anvil tubular micrometer or other accurate device at closely spaced intervals to ensure that minimum and maximum wall thicknesses to the nearest 0.001 in. (0.02 mm) have been determined. Make a minimum of six measurements at each cross section.

### 10.5 Pressure Testing:

10.5.1 *Preparation of Specimens for Pressure Testing*—Prepare test specimens in such a manner that each, whether individual fittings or groups of fittings, is a system incorporating at least one length of pipe or tubing. Fuse all fitting outlets with the appropriate size pipe or tubing. At least one piece of pipe or tubing in the system shall have a minimum length equal to five pipe diameters.

#### 10.5.2 Sustained Pressure Test:

10.5.2.1 Select the test temperature and pressures from one of the options offered in Table 8.

10.5.2.2 Select six test specimens at random and condition at the selected option test temperature. Test the fittings specimens with water, in accordance with Test Method D 1598 at the selected option of temperature, stress, and hours of testing.

NOTE 2—Other test mediums and test conditions than offered in Table 8 may be used as agreed upon between the manufacturer and the purchaser.

**TABLE 8 Sustained Pressure Test Options for Common Fitting Sizes**

Wall Thickness DR or Schedule	Nominal Diameter	Option 1 <sup>A,B</sup>		Option 2 <sup>C,B</sup>	Option 3 <sup>D,B</sup>
		At 73.4°F (23°C) for 1000 h		At 176°F (80.0°C) for 1000 h	At 176°F (80.0°C) for 170 h
		PE2406 psig, MPa	PE3408 Material Only psig,MPa	PE2406 PE3408 psig, MPa	PE2406 PE3408 psig, MPa
DR 7	<sup>E</sup>	440 (3.036)	535 (3.692)	195 (1.346)	225 (1.553)
SDR 9	<sup>E</sup>	330 (2.277)	400 (2.760)	145 (1.001)	170 (1.173)
DR 9.3	<sup>E</sup>	320 (2.208)	385 (2.657)	140 (0.966)	160 (1.104)
SDR 11	<sup>E</sup>	265 (1.829)	320 (2.208)	115 (0.794)	135 (0.932)
DR 11.5	<sup>E</sup>	250 (1.725)	305 (2.105)	110 (0.759)	130 (0.897)
DR 15.5	<sup>E</sup>	180 (1.242)	220 (1.518)	80 (0.552)	90 (0.621)
SDR 17	<sup>E</sup>	165 (1.139)	200 (1.380)	75 (0.504)	85 (0.587)
SDR 21	<sup>E</sup>	130 (0.897)	160 (1.104)	60 (0.414)	65 (0.449)
DR 26	<sup>E</sup>	105 (0.728)	130 (0.8883)	45 (0.320)	55 (0.370)
DR 32.5	<sup>E</sup>	85 (0.587)	101 (0.690)	35 (0.242)	40 (0.276)
0.062	½ CTS	290 (2.001)	350 (2.415)	130 (0.897)	150 (1.035)
0.062	¾ CTS	200 (1.380)	245 (1.691)	90 (0.621)	100 (0.690)
0.062	1 CTS	155 (1.070)	185 (1.277)	70 (0.483)	80 (0.552)
0.090	½ CTS	445 (3.071)	540 (3.726)	195 (1.346)	225 (1.553)
0.090	¾ CTS	305 (2.105)	365 (2.519)	135 (0.932)	155 (1.070)
0.090	1 CTS	230 (1.587)	280 (1.932)	100 (0.690)	115 (0.794)
0.090	1 ¼ CTS	185 (1.277)	225 (1.553)	80 (0.552)	95 (0.656)
SCH 40	½ IPS	395 (2.726)	475 (3.278)	175 (1.208)	200 (1.380)
SCH 40	¾ IPS	320 (2.208)	385 (2.657)	140 (0.966)	160 (1.104)
SCH 40	1 IPS	295 (2.036)	360 (2.484)	130 (0.897)	150 (1.035)
SCH 40	1 ¼ IPS	245 (1.691)	295 (2.036)	105 (0.725)	125 (0.863)
SCH 40	1 ½ IPS	220 (1.518)	265 (1.829)	95 (0.656)	110 (0.759)
SCH 40	2 IPS	185 (1.277)	220 (1.518)	80 (0.552)	95 (0.656)
SCH 40	3 IPS	175 (1.208)	210 (1.449)	75 (0.518)	90 (0.621)
SCH 40	4 IPS	145 (1.001)	180 (1.242)	65 (0.449)	75 (0.518)
SCH 40	6 IPS	115 (0.794)	140 (0.966)	50 (0.345)	60 (0.414)
SCH 40	8 IPS	100 (0.690)	125 (0.863)	45 (0.311)	50 (0.345)
SCH 40	10 IPS	95 (0.656)	110 (0.759)	40 (0.276)	45 (0.311)
SCH 40	12 IPS	85 (0.587)	105 (0.725)	40 (0.276)	45 (0.311)
SCH 40	16 IPS	85 (0.587)	105 (0.725)	35 (0.242)	45 (0.311)
SCH 40	20 IPS	80 (0.552)	100 (0.690)	35 (0.242)	40 (0.276)

<sup>A</sup> Test at 73.4° fiber stress of 1320 psi (9 MPa) for PE2406. Fiber stress of 1600 psi (11.02 MPa) for PE3408.

<sup>B</sup> 170 h elevated temperature test fiber stress of 670 psi (4.6 MPa) all materials.

<sup>C</sup> All psig values were rounded to nearest 5 psig.

<sup>D</sup> 1000 h elevated temperature test fiber stress of 580 psi (4.0 MPa) all materials.

<sup>E</sup> Refers to IPS and ISO diameters shown in Table 2 and Table 3.

10.5.2.3 Failure of two of the six specimens tested shall constitute failure of 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 of the test.

10.5.3 *Minimum Hydrostatic Burst Pressure for Fittings ½ to 12 in. and 90 to 315 mm, Nominal Diameter*—The test equipment, procedures, and failure definitions shall be as specified in Test Method D 1599. The hydrostatic pressure shall be increased at a uniform rate such that the specimen fails between 60 and 70 s from start of test. Minimum failure pressures are shown in Table 7.

10.5.4 *Minimum Hydrostatic Pressure for Fittings 14 to 48 in. and 355 to 1600 mm, Nominal Diameter*—The test equipment and procedures shall be as specified in Test Method D 1599. The hydrostatic pressure shall be increased at a uniform rate such that the test pressure is reached within 60 to 70 s from the start of the test. No failure should occur in the sample during the test period.

## 11. Product Marking

11.1 Fittings shall be marked with the following:

11.1.1 This designation: “ASTM D 3261,”

11.1.2 Manufacturer’s name or trademark,

11.1.3 Material designations (such as PE2406 or PE3408),

11.1.4 Date of manufacture or manufacturing code,

11.1.5 Size.

11.2 Where the physical size of the fitting does not allow complete marking, marking may be omitted in the following sequence: size, date of manufacture, material designation, manufacturer’s name or trademark.

11.3 Where recessed marking is used, take care not to reduce the wall thickness below the minimum specified.

## 12. Quality Assurance

12.1 When the product is marked with this designation, D 3261, 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.

## 13. Keywords

13.1 butt fusion fittings; fittings; polyethylene fittings; polyethylene pipe; polyethylene tubing

## 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 the performance of all inspection and test requirements specified herein. The producer may 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 S1.1—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 practice 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 S2.1—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.

### ADDITIONAL SUPPLEMENTARY REQUIREMENTS

This requirement applies whenever a Regulatory Authority or ser calls for the product to be used to convey or to be in contact with potable water.

S3. *Potable Water Requirement*—Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard 61 or the

health effects portion of NSF Standard 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.

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