



Standard Specification for Black Crosslinked Polyethylene (PEX) Pipe, Fittings and Joints For Gas Distribution Applications¹

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1. Scope—Scope*

1.1 This specification covers outside diameter controlled, black metric-sized and IPS-sized crosslinked polyethylene (PEX) pipe, fittings and joints, made in pipe dimension ratios ranging from 6 to 17, and pressure rated for gas distribution. Included are requirements and test methods for material, workmanship, dimensions, burst pressure, hydrostatic sustained pressure, stabilizer functionality, bent-pipe hydrostatic pressure, degree of crosslinking, chemical resistance, and squeeze-off. Requirements for pipe and fittings markings are also given. The pipe, fittings and joints covered by this specification are intended for buried gas distribution and gas transmission pressure piping applications.

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 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

NOTE 1—Metric sized (SI units) pipe should only be joined with corresponding metric sized fittings, and inch sized pipe should only be joined with corresponding inch sized fittings. Inch sized fittings should not be used for metric sized pipe, and metric sized fittings should not be used for inch sized pipe.

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.*

2. Referenced Documents

2.1 ASTM Standards:²

- [D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents](#)
- [D618 Practice for Conditioning Plastics for Testing](#)
- [D792 Test Methods for Density and Specific Gravity \(Relative Density\) of Plastics by Displacement](#)
- [D1505 Test Method for Density of Plastics by the Density-Gradient Technique](#)
- [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](#)
- [D1600 Terminology for Abbreviated Terms Relating to Plastics](#)
- [D1603 Test Method for Carbon Black Content in Olefin Plastics](#)
- [D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings](#)
- [D2290 Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe](#)
- [D2765 Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics](#)
- [D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products](#)
- [D4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique](#)
- [F412 Terminology Relating to Plastic Piping Systems](#)
- [F876 Specification for Crosslinked Polyethylene \(PEX\) 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.

*A Summary of Changes section appears at the end of this standard

- F1041** Guide for Squeeze-Off of Polyolefin Gas Pressure Pipe and Tubing
- F1055** Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
- F1563** Specification for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing
- F1948** Specification for Metallic Mechanical Fittings for Use on Outside Diameter Controlled Thermoplastic Gas Distribution Pipe and Tubing
- F2897** Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances)

2.2 *Federal Standard:*³

FED-STD-123 Marking for Shipment (Civil Agencies)

2.3 *Military Standard:*³

MIL-STD-129 Marking for Shipment and Storage

2.4 *ISO Standards:*⁴

ISO 1167 Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method

ISO 14531-2 Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 2: Fittings for heat-fusion jointing

ISO 14531-3 Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 3: Fittings for mechanical jointing (including PE-X/metal transitions)

2.5 *PPI Standards:*⁵

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

PPI TR-4 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

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology **F412**, and abbreviations are in accordance with Terminology **D1600**, unless otherwise specified. The abbreviation for crosslinked polyethylene is PEX. Plastic pipe denotes a particular diameter schedule of plastic pipe that is outside diameter controlled.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *crosslinked polyethylene, n*—molecular chains chemically connected through irradiation with high-energy electron beams, or chemical agents such as organic peroxides or silanes, a polyethylene material that has undergone a change in molecular structure using a chemical or a physical process whereby the polymer chains are chemically linked.

3.2.2 *PEX pipe material designation code*—The PEX pipe material designation code shall consist of the abbreviation for crosslinked polyethylene (PEX) followed by four Arabic digits as shown in **Table 1**, and as defined in Terminology **F412** for PEX pipe materials.

4. Pipe Classification

4.1 *General*—This standard covers black PEX pipe that is pressure rated based on HDB at 73°F [23°C] and 200°F [93°C]. Pressure ratings for temperatures between 73°F [23°C] and 200°F [93°C] are determined by temperature interpolation in accordance with PPI TR-3.

4.2 *Classification*—PEX pipes are classified by their PEX pipe material designation codes as shown in **Table 1**.

³ DLA Document Services Building 4/D 700 Robbins Avenue Philadelphia, PA 19111-5094 <http://quicksearch.dla.mil/>

⁴ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, <http://www.iso.org>.

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

TABLE 1 PEX Pipe Material Designation Codes

| PEX Pipe Material Designation Code | 73°F [23°C] HDB Psi [MPa] | 200°F [93°C] HDB Psi [MPa] |
|------------------------------------|------------------------------|-------------------------------|
| PEX 0006 | 1250 [8.62] | 630 [4.34] |
| PEX 0008 | 1600 [11.03] | 630 [4.34] |
| PEX 0009 | 1800 [12.41] | 630 [4.34] |

5. Materials

5.1 *General*—PEX pipes, meeting the requirements of this specification, are defined by means of (1) degree of crosslinking per 6.7, and (2) long-term strength tests per Test Method D2837 to determine HDB per Table 1. The HDB is a property of the PEX compound, which is used to make the PEX pipe.

5.2 *Basic Materials*—PEX pipe and fittings shall be made from PE compounds, which have been crosslinked by peroxides, azo compounds, or silane compounds in extrusion, or by electron beam after extrusion, such that the pipe meets the performance requirements of Section 6. The materials, procedure for mixing, and the process for crosslinking shall result in a product with Hydrostatic Design Basis ratings equal to or better than those shown in Table 1, when determined in accordance with procedures no less restrictive than those of Test Method D2837, and the PEX material shall have a Plastics Pipe Institute (PPI) long-term hydrostatic design stress and hydrostatic design basis rating per PPI TR-3. See Appendix X1 for additional information on PPI hydrostatic stress ratings.

5.3 *Pipe Material Designation Code*—The PEX material meeting the requirements of this specification shall be designated PEX 0006, PEX 0008 or PEX 0009.

NOTE 2—The first two digits in the pipe material designation code are for chlorine resistance and UV resistance. A “0” indicates “not tested”. If either of these properties has been tested, then the “0” is replaced by the appropriate digit.

5.4 *Density*—When determined in accordance with 7.5, the PE base resin used for PEX pipe, without carbon black, used for PEX pipe shall have a minimum average density of 0.926 g/cm³.

5.5 *Carbon Black*—PE compounds used to make PEX pipe shall contain 2.0 to 3.0 percent well dispersed carbon black as measured in the PEX pipe by Test Methods D1603 or D4218.

5.6 *Rework Material*—PEX rework shall not be used in the manufacture of PEX pipes and fittings made in accordance to this specification.

5.7 *Chemical Resistance*—The PEX material 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 7.11.

NOTE 3—This test is only an indication of what will happen as a result of short-term exposure to these chemicals. For long-term results, additional testing is required.

6. Requirements

6.1 *Workmanship*—The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects. The pipe shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

6.2 *Out-of Roundness*—The maximum out-of roundness requirements shown in Table 2 and Table 3 for pipe apply to the average measured diameter in accordance with 7.4.1.

6.3 Dimensions and Tolerances:

6.3.1 *Outside Diameters*—The outside diameters and tolerances shall be as shown in Table 2 or Table 3, when measured in accordance with 7.4 and 7.4.1.

6.3.2 *Wall Thickness*—The wall thickness and tolerances shall be as shown in Table 4 or Table 5, when measured in accordance with 7.4 and 7.4.2.

6.4 *Sustained Pressure 73°F [23°C]*—The PEX pipe shall not fail in less than 1000 h when tested in accordance with 7.6. For PEX 0006 the stress shall be 1320 psi [9.1 MPa], for PEX 0008 the stress shall be 1650 psi [11.3 MPa], and for PEX 0009 the stress shall be 2050 psi [14.1 MPa]. 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 stress shall be 90 % of the HDB.

6.5 *Minimum Hydrostatic Burst Pressure (Quick Burst)*—The pipe shall fail in a ductile manner when tested in accordance with 7.7. For pipe sizes above 4 in [110 mm] nominal diameter, the testing lab shall be allowed to replace the quick burst test by the apparent ring tensile strength test in 6.6.

6.6 *Apparent Tensile Strength at Yield*—When tested in accordance to 7.8, the PEX pipe shall demonstrate a minimum of 3000 psi [20.7 MPa] for PEX 0006, 3700 psi [25.5 MPa] for PEX 0008, and 4600 psi [31.7 MPa] for PEX 0009.

6.7 *Degree of Crosslinking*—When tested in accordance with 7.9, the degree of crosslinking for PEX pipe material shall be within the range from 65 to 89 % inclusive. Depending on the process used, the following minimum percentage crosslinking values shall be achieved: 73 % by peroxides, 65 % by electron beam, or 65 % by silane compounds.

6.8 *Stabilizer Functionality*—Stabilizer Functionality shall be tested in accordance with 7.10. The test need only be performed for the original validation of pipe made from a particular compound.

6.9 Bent Pipe Hydrostatic Sustained Pressure Strength:

TABLE 2 Metric-sized Outside Diameters and Tolerances for PEX Pipe

| Pipe Size | Average Outside Diameter | | Tolerances for Average Diameter | | Out-of-Roundness | |
|-----------|--------------------------|---------|---------------------------------|-------|------------------|------|
| | mm | mm | mm | mm | mm | mm |
| 16 | | 16.15 | | ±0.15 | | 1.2 |
| 20 | | 20.15 | | ±0.15 | | 1.2 |
| 25 | | 25.15 | | ±0.15 | | 1.2 |
| 32 | | 32.15 | | ±0.15 | | 1.3 |
| 40 | | 40.20 | | ±0.20 | | 1.4 |
| 50 | | 50.20 | | ±0.20 | | 1.4 |
| 63 | | 63.20 | | ±0.20 | | 1.5 |
| 75 | | 75.25 | | ±0.25 | | 1.6 |
| 90 | | 90.30 | | ±0.30 | | 1.8 |
| 110 | | 110.35 | | ±0.35 | | 2.2 |
| 125 | | 125.40 | | ±0.40 | | 2.5 |
| 140 | | 140.45 | | ±0.45 | | 2.8 |
| 160 | | 160.50 | | ±0.50 | | 3.2 |
| 180 | | 180.55 | | ±0.55 | | 3.6 |
| 200 | | 200.60 | | ±0.60 | | 4.0 |
| 225 | | 225.70 | | ±0.70 | | 4.5 |
| 250 | | 250.75 | | ±0.75 | | 5.0 |
| 280 | | 280.85 | | ±0.85 | | 9.8 |
| 315 | | 315.95 | | ±0.95 | | 11.1 |
| 355 | | 356.10 | | ±1.10 | | 12.5 |
| 400 | | 410.20 | | ±1.20 | | 14.0 |
| 450 | | 451.35 | | ±1.35 | | 15.6 |
| 500 | | 501.50 | | ±1.50 | | 17.5 |
| 560 | | 561.70 | | ±1.70 | | 19.6 |
| 630 | | 631.90 | | ±1.90 | | 22.1 |
| 710 | | 713.20 | | ±3.20 | | 24.8 |
| 800 | | 813.00 | | ±3.60 | | 28.0 |
| 900 | | 904.05 | | ±4.05 | | 31.5 |
| 1000 | | 1004.50 | | ±4.50 | | 35.0 |

TABLE 3 Inch-sized Outside Diameters and Tolerances for PEX Pipe

| Pipe Size | Outside Diameter | | Tolerances for Outside Diameter (±) | |
|-----------|------------------|--------|-------------------------------------|-------|
| | in. | in. | in. | in. |
| 3 | | 3.500 | | 0.016 |
| 4 | | 4.500 | | 0.020 |
| 5 | | 5.563 | | 0.025 |
| 6 | | 6.625 | | 0.030 |
| 8 | | 8.625 | | 0.039 |
| 10 | | 10.750 | | 0.048 |
| 12 | | 12.750 | | 0.057 |
| 14 | | 14.000 | | 0.063 |
| 16 | | 16.000 | | 0.072 |
| 18 | | 18.000 | | 0.081 |
| 20 | | 20.000 | | 0.090 |
| 22 | | 22.000 | | 0.099 |
| 24 | | 24.000 | | 0.108 |
| 26 | | 26.000 | | 0.117 |
| 28 | | 28.000 | | 0.126 |
| 30 | | 30.000 | | 0.135 |
| 32 | | 32.000 | | 0.144 |
| 34 | | 34.000 | | 0.153 |
| 36 | | 36.000 | | 0.162 |
| 42 | | 42.000 | | 0.189 |
| 48 | | 48.000 | | 0.216 |
| 54 | | 54.000 | | 0.243 |

6.9.1 *General*—PEX pipe sizes and DR's deemed suitable for bending by the pipe manufacturer shall meet the requirements in 6.9.2.

6.9.2 Cold-bent pipe, with a radius of six (6) times the outside diameter and consisting of a continuous bend length inducing not less than 90° angle, shall meet the minimum hydrostatic sustained pressure strength requirements in 6.4 when tested in accordance with 7.6.

6.10 *Squeeze-Off*—This requirement is limited to pipe sizes, wall thicknesses, squeeze procedures, and conditions deemed suitable for squeeze-off in service by the pipe manufacturer. Squeeze-off shall be performed per Guide F1041 using tools that meet Specification F1563. There shall be no leakage or visual evidence of splitting, cracking, breaking or reduction in 1000-h sustained pressure category when pipe is tested in accordance with 7.12.

TABLE 4 Metric-sized Wall Thickness and Tolerances for PEX Plastic Pipe

| Pipe Size [mm] | Minimum Wall Thickness (t), mm (tolerance is plus 12%) | | | | | | | |
|----------------|--|--------|------|-------|---------|---------|-------|-------|
| | DR 6 | DR 7.4 | DR 9 | DR 11 | DR 13.6 | DR 16.2 | DR 17 | DR 21 |
| 16 | 3.0 | 2.3 | 2.0 | ... | ... | ... | ... | ... |
| 20 | 3.4 | 3.0 | 2.3 | 2.0 | ... | ... | ... | ... |
| 25 | 5.4 | 3.5 | 3.0 | 2.3 | 2.0 | ... | ... | ... |
| 32 | 5.4 | 4.4 | 3.6 | 3.0 | 2.4 | 2.0 | 2.0 | 2.3 |
| 40 | 6.7 | 5.5 | 4.5 | 3.7 | 3.0 | 2.5 | 2.4 | 2.8 |
| 50 | 8.3 | 6.9 | 5.6 | 4.6 | 3.7 | 3.1 | 3.0 | 3.4 |
| 63 | 10.5 | 8.6 | 7.1 | 5.8 | 4.7 | 3.9 | 3.8 | 4.3 |
| 75 | 12.5 | 10.3 | 8.4 | 6.8 | 5.6 | 4.6 | 4.5 | 5.1 |
| 90 | 15.0 | 12.3 | 10.1 | 8.2 | 6.7 | 5.6 | 5.4 | 6.1 |
| 110 | 18.3 | 15.1 | 12.3 | 10.0 | 8.1 | 7.7 | 6.6 | 7.4 |
| 125 | 20.8 | 17.1 | 14.0 | 11.4 | 9.2 | 7.7 | 7.4 | 8.3 |
| 140 | 23.3 | 19.2 | 15.7 | 12.7 | 10.3 | 8.7 | 8.3 | 9.3 |
| 160 | 26.6 | 21.9 | 17.9 | 14.6 | 11.8 | 9.9 | 9.5 | 10.6 |
| 180 | 29.9 | 24.6 | 20.1 | 16.4 | 13.3 | 11.1 | 10.7 | 11.9 |
| 200 | 33.2 | 27.4 | 22.4 | 18.2 | 14.7 | 12.4 | 11.9 | 13.2 |
| 225 | 37.4 | 30.8 | 25.2 | 20.5 | 16.6 | 13.9 | 13.4 | 14.9 |
| 250 | 41.5 | 34.2 | 27.9 | 22.7 | 18.4 | 15.5 | 14.8 | 16.4 |
| 280 | 46.5 | 38.3 | 31.3 | 25.4 | 20.6 | 17.3 | 16.6 | 18.4 |
| 315 | 52.3 | 43.1 | 35.2 | 28.6 | 23.2 | 19.5 | 18.7 | 20.7 |
| 355 | 59.0 | 48.5 | 39.7 | 32.2 | 26.1 | 21.9 | 21.1 | 23.4 |
| 400 | ... | 54.7 | 44.7 | 36.3 | 29.4 | 24.7 | 26.2 | 23.7 |
| 450 | ... | 61.5 | 50.3 | 40.9 | 33.1 | 27.8 | 26.7 | 29.5 |
| 500 | ... | ... | 55.8 | 45.4 | 36.8 | 30.9 | 29.7 | 32.8 |
| 560 | ... | ... | 62.5 | 50.8 | 41.2 | 34.6 | 33.2 | 36.7 |
| 630 | ... | ... | 70.3 | 57.2 | 46.3 | 38.9 | 37.4 | 41.3 |
| 710 | ... | ... | 79.3 | 64.5 | 52.2 | 43.9 | 42.1 | 46.5 |
| 800 | ... | ... | 89.3 | 72.6 | 58.8 | 49.4 | 47.4 | 52.3 |
| 900 | ... | ... | ... | 81.7 | 66.2 | 56.6 | 53.3 | 58.8 |
| 1000 | ... | ... | ... | 90.2 | 72.5 | 61.8 | 59.3 | 65.4 |

TABLE 5 Inch-sized Wall Thickness and Tolerances for PEX Plastic Pipe

| Pipe Size, in. | Minimum Wall Thickness (t), in (tolerance is plus 12%) | | | | | | | |
|----------------|--|--------|-------|-------|---------|---------|-------|-------|
| | DR 7.3 | DR 8.3 | DR 9 | DR 11 | DR 13.5 | DR 15.5 | DR 17 | DR 21 |
| 3 | 0.479 | 0.422 | 0.389 | 0.318 | 0.259 | 0.226 | 0.206 | 0.167 |
| 4 | 0.616 | 0.542 | 0.500 | 0.409 | 0.333 | 0.290 | 0.265 | 0.214 |
| 5 | 0.762 | 0.670 | 0.618 | 0.506 | 0.412 | 0.359 | 0.327 | 0.265 |
| 6 | 0.908 | 0.798 | 0.736 | 0.602 | 0.491 | 0.427 | 0.390 | 0.315 |
| 8 | 1.182 | 1.039 | 0.958 | 0.784 | 0.639 | 0.556 | 0.507 | 0.411 |
| 10 | 1.473 | 1.295 | 1.194 | 0.977 | 0.796 | 0.694 | 0.632 | 0.512 |
| 12 | 1.747 | 1.536 | 1.417 | 1.159 | 0.944 | 0.823 | 0.750 | 0.607 |
| 14 | 1.918 | 1.687 | 1.556 | 1.273 | 1.037 | 0.903 | 0.824 | 0.667 |
| 16 | 2.192 | 1.928 | 1.778 | 1.455 | 1.185 | 1.032 | 0.941 | 0.762 |
| 18 | 2.466 | 2.169 | 2.000 | 1.636 | 1.333 | 1.161 | 1.059 | 0.857 |
| 20 | ... | 2.409 | 2.222 | 1.818 | 1.481 | 1.290 | 1.176 | 0.952 |
| 22 | ... | ... | 2.444 | 2.000 | 1.630 | 1.419 | 1.294 | 1.048 |
| 24 | ... | ... | 2.667 | 2.182 | 1.778 | 1.548 | 1.412 | 1.143 |
| 26 | ... | ... | ... | 2.364 | 1.926 | 1.677 | 1.529 | 1.238 |
| 28 | ... | ... | ... | 2.545 | 2.074 | 1.806 | 1.647 | 1.333 |
| 30 | ... | ... | ... | 2.727 | 2.222 | 1.935 | 1.765 | 1.429 |
| 32 | ... | ... | ... | 2.909 | 2.370 | 2.065 | 1.882 | 1.524 |
| 34 | ... | ... | ... | 3.091 | 2.519 | 2.194 | 2.000 | 1.619 |
| 36 | ... | ... | ... | 3.273 | 2.667 | 2.323 | 2.118 | 1.714 |
| 42 | ... | ... | ... | ... | ... | 2.710 | 2.471 | 2.000 |
| 48 | ... | ... | ... | ... | ... | 3.097 | 2.824 | 2.286 |
| 54 | ... | ... | ... | ... | ... | ... | 3.176 | 2.571 |

6.11 *Elevated Temperature Service*—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 6** and be listed as the “hydrostatic design basis of XXX psi at XXX °F [C°] for (compound name).”

6.12 *Fittings and Joints:*

6.12.1 Fittings intended for use with PEX pipe at temperatures up to 200°F [93°C] shall meet the dimensional, design and performance requirements for the corresponding fitting product standard, such as Specification **F1055**, ISO 14531-2, or ISO 14531-3. Fittings shall be compatible with PEX pipe made to this specification. The fittings manufacturer shall recommend their fittings for use with PEX pipe in the intended application. PEX pipe shall only be joined using qualified joining procedures.

TABLE 6 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] | 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] |

Example: EE - At 180°F [82°C] the HDB is 1000 psi [6.9 MPa].

6.12.2 PE electrofusion fittings shall only be used for temperatures up to 140°F [60°C]. PEX electrofusion fittings shall be used for temperatures above 140°F [60°C] up to 200°F [93°C]. All electrofusion joints made between PEX pipe and electrofusion fittings shall meet the joint performance requirements as specified in the applicable fittings standard, such as Specification **F1055** or ISO 14531-2.

NOTE 4—The following performance requirements are described in these ASTM and ISO standards for electrofusion fittings – 68°F [20°C] or 73°F [23°C] hydrostatic strength, 176°F [80°C] hydrostatic strength, short-term internal pressure resistance, resistance to tensile loads, cohesive resistance for electrofusion saddle and socket fittings at both the minimum and maximum recommended temperatures, impact resistance for saddle fittings.

6.12.3 All mechanical fitting joints made between PEX pipe and mechanical fittings shall meet the joint performance requirements as specified in the applicable fitting standard, such as Specification **F1948** or ISO 14531-3.

NOTE 5—The following performance requirements are described for mechanical fittings – 68°F [20°C] hydrostatic strength, elevated temperature hydrostatic strength, short-term internal pressure resistance, resistance to tensile loads, impact resistance for saddle fittings, leak tightness under internal pressure, leak tightness under internal pressure when subjected to bending, external pressure test, and resistance to pull out under constant longitudinal force.

6.13 All tests shall be repeated if there is a change in the crosslinking agent, antioxidant package or the base PE resin for the PEX compound.

7. Test Methods

7.1 *Conditioning*—Condition the specimens at 73.4 ± 3.6°F [23 ± 2°C] and 50 ± 10% relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice **D618**, for those tests where conditioning is required. In cases of disagreement, the tolerances shall be ±1.8°F [±1°C] and ±2 % relative humidity.

7.2 *Test Conditions*—Conduct the test in the standard laboratory atmosphere of 73.4 ± 3.6°F [23 ± 2°C] and 50 ± 10 % relative humidity, unless otherwise specified in the test methods or in this specification. In cases of disagreement, the tolerances shall be ±1.8°F [±1°C] and ±2 % relative humidity.

7.3 *Sampling*—A sufficient quantity of pipe, as agreed upon by the purchaser and the seller, shall be selected and tested to determine conformance with this specification. In the case of no prior agreement, random samples selected by the testing laboratory shall be deemed adequate.

7.3.1 *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 that is at least one pipe diameter away from an end closure.

7.4 *Dimensions and Tolerances*—Use any length of pipe to determine the dimensions. Measure in accordance with Test Method **D2122**.

7.4.1 *Outside Diameter*—Measure the outside diameter and out-of roundness of the pipe in accordance with Test Method **D2122**. The referee method of measurement is to be by circumferential wrap tape. The tolerance for out-of-roundness shall apply only to pipe prior to shipment. Averaging micrometer or vernier caliper measurements, six (6) maximum and minimum diameter measurements at any cross section, may be used for quality control checks if desired.

7.4.2 *Wall Thickness*—Make micrometer measurements of the wall thickness in accordance with Test Method **D2122** to determine the maximum and minimum values.

7.5 *Density*—Determine the density of the PE base resin, without carbon black, in accordance with Test Method **D1505**, or Test Methods **D792**, for three specimens. The density is the average of the three measurements.

7.6 Sustained Pressure Test:

7.6.1 Select six test specimens of pipe at random, condition at the standard laboratory test temperature and humidity, and pressure test in accordance with Test Method **D1598**.

7.6.1.1 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 160 mm [6 in]. For larger sizes, the minimum length shall be equal to 3 times the diameter or 30 in. [762 mm], whichever is shorter.