This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F877 – 24

An American National Standard

Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems[1]

This standard is issued under the fixed designation F877; 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 requirements, test methods, and marking requirements for system components when tested with nominal SDR9 crosslinked polyethylene (PEX) tubing as a system. Systems are intended for 100 psi (0.69 MPa) water service up to and including a maximum working temperature of 180 °F (82 °C). Requirements and test methods are included for materials, workmanship, dimensions and tolerances, burst pressure, hydrostatic sustained pressure, excessive temperature and pressure, corrosion resistance, and thermocycling tests. The components covered by this specification are intended for use in, but not limited to, residential and commercial hot and cold potable water distribution systems or other applications such as reclaimed water, fire protection, municipal water service lines, building supply lines, radiant heating and cooling systems, hydronic distribution systems, snow and ice melting systems, geothermal ground loops, district heating, turf conditioning, compressed air distribution, and building services pipe.

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.

NOTE 1—Suggested hydrostatic design stresses and hydrostatic pressure ratings for tubing and fittings are listed in Appendix X1. Design, assembly, and installation considerations are discussed in Appendix X2. An optional performance qualification and an in-plant quality control program are recommended in Appendix X3. For additional information on the use of PEX tubing for high-temperature non-potable applications and for chlorinated potable water, see PPI Technical Notes 52 and 53, respectively.

1.4 The following safety hazards caveat pertains only to the test method portion, Section 7, 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D618 Practice for Conditioning Plastics for Testing

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 (Withdrawn 2024)[3]

D2749 Symbols for Dimensions of Plastic Pipe Fittings

D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

F412 Terminology Relating to Plastic Piping Systems

F876 Specification for Crosslinked Polyethylene (PEX) Tubing

F1807 Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing

F1960 Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.61 on Water.

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

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

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

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F2080 Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe
F2098 Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) to Metal Insert and Plastic Insert Fittings
F2159 Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps for SDR9 Crosslinked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing
F2434 Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing
F2735 Specification for Plastic Insert Fittings For SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing
F2854 Specification for Push-Fit Crosslinked Polyethylene (PEX) Mechanical Fittings for Crosslinked Polyethylene (PEX) Tubing
F3347 Specification for Metal Press Insert Fittings with Factory Assembled Stainless Steel Press Sleeve for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing
F3348 Specification for Plastic Press Insert Fittings with Factory Assembled Stainless Steel Press Sleeve for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing

2.2 *ASSE Standard:*[4]
ASSE 1061 Performance Requirements for Push-Fit Fittings

2.3 *ANSI Standards:*
B 36.10 Welded and Seamless Wrought Steel Pipe[5]

2.4 *AWWA Standard:*
Manual M-11, Steel Pipe Design and Installation[6]

2.5 *Federal Standard:*
Fed Std. No. 123 Marking for Shipment (Civil Agencies)[7]

2.6 *Military Standard:*
MIL-STD-129 Marking for Shipment and Storage[7]

2.7 *NSF Standard:*[8]
NSF/ANSI Standard No. 14 for Plastic Piping Components and Related Materials
NSF/ANSI Standard No. 61 for Drinking Water System Components-Health Effects

2.8 *Plastic Pipe Institute Technical Notes:*[9]
Technical Note-52 Guide to High-Temperature Applications of Non-Potable PEX Pipe and Tubing Systems
Technical Note-53 Guide to Chlorine Resistance Ratings of PEX Pipes and Tubing for Potable Water Applications

3. Terminology

3.1 The terminology used in this specification is in accordance with Terminology F412, Terminology D1600, and Symbols D2749, unless otherwise specified. The abbreviation for crosslinked polyethylene is PEX. Plastic tubing denotes a particular diameter schedule of plastic pipe in which outside diameter of the tubing is equal to the nominal size plus ⅛ in. Plastic pipe outside diameter schedule conforms to ANSI B 36.10.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *crosslinked polyethylene plastics*—a polyethylene material that has undergone a change in molecular structure through processing whereby a majority of the polymer chains are chemically linked.

3.2.2 *fitting*—a piping component used to join or terminate sections of PEX tubing or to provide changes of direction or branching in a piping system. This includes appurtenances such as couplings, elbows, tees, or plugs used to connect tubing or as an accessory to tubing.

3.2.3 *standard dimension ratio (SDR)*—the ratio of outside diameter to wall thickness. For PEX tubing, it is calculated by dividing the average outside diameter of the tubing in inches or in millimeters by the minimum wall thickness in inches or millimeters. If the wall thickness calculated by this formula is less than 0.070 in. (1.78 mm) it shall be arbitrarily increased to 0.070 in. except for nominal tubing sizes 5⁄16 and smaller, as specified in Table 3. The SDR values shall be rounded to the nearest 0.5.

3.2.4 *manifold*—an appurtenance that has at least one inlet and multiple outlets with integral fittings, valves, or both.

3.2.5 *system components*—fittings, valves with integral fittings, and manifolds which connect directly to PEX tubing made in accordance with Specification F876.

3.2.6 *system component assembly*—system component connected directly to PEX tubing made in accordance with Specification F876.

4. Materials

4.1 *General*—PEX systems shall use crosslinked polyethylene tubing as described in Specification F876.

4.2 Fitting and manifold materials shall meet the applicable requirements as described in Specifications F1807, F1960, F2080, F2098, F2159, F2434, F2735, F2854, F3347 or F3348, or Standard ASSE 1061.

4.3 *Certification*—PEX tubing and system components, used for the distribution of potable water, shall be products approved for that service by the regulatory bodies having such

[4] Available from ASSE International, 18927 Hickory Creek Dr, Suite 220, Mokena, IL 60448, http://www.asse-plumbing.org
[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[6] Available from American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, http://www.awwa.org.
[7] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.
[8] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.
[9] Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.