Designation: F877 – 11a

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 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, sustained pressure, excessive temperature and pressure, and thermo-cycling tests. The components covered by this specification are intended for use in residential and commercial, hot and cold, potable water distribution systems or other applications such as municipal water service lines, radiant panel heating systems, hydronic baseboard heating systems, snow and ice melting systems, 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 the standard. The values stated in parentheses are provided for information only.

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.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

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

D1898 Practice for Sampling of Plastics (Withdrawn 1998)[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

D3140 Practice for Flaring Polyolefin Pipe and Tubing (Withdrawn 1999)[3]

F412 Terminology Relating to Plastic Piping Systems

F876 Specification for Crosslinked Polyethylene (PEX) Tubing

F1960 Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing

F1961 Specification for Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing

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

F1865 Specification for Mechanical Cold Expansion Insert Fitting With Compression Sleeve for Cross-linked Polyethylene (PEX) Tubing

F2080 Specification for Cold-Expansion Fittings With Metal Compression-Sleeves for Cross-Linked Polyethylene (PEX) Pipe

F2159 Specification for Plastic Insert Fittings Utilizing a

[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**

Copper Crimp Ring for SDR9 Cross-linked 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

2.2 *ANSI Standards:*

B 36.10 Welded and Seamless Wrought Steel Pipe[4]

Z 17.1 Preferred Numbers[4]

2.3 *AWWA Standard:*

Manual M-11, Steel Pipe Design and Installation[5]

2.4 *Federal Standard:*

Fed Std. No. 123 Marking for Shipment (Civil Agencies)[6]

2.5 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[6]

2.6 *NSF Standard:*

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

NSF/ANSI Standard No. 61 for Drinking Water System Components-Health Effects[7]

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*—plastics prepared by crosslinking (curing) polyethylene compounds.

3.2.2 *fitting*—an appurtenance such as coupling, elbow or tee used to connect tubing or as an accessory to tubing.

3.2.3 *standard dimension ratio (SDR)*—a selected series of numbers in which the average outside diameter to minimum wall thickness dimension ratios are constant for all sizes of tubing in each standard dimension ratio, and which are the ANSI Z 17.1 Preferred Number Series R 10 modified by +1.

3.2.4 *manifold*—an appurtenance that has at least one inlet and multiple outlets.

3.2.5 *system components*—fittings and manifolds.

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, F1865, F1960, F1961, F2080, F2159, F2434, F2735, or F2854.

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 jurisdiction. These products shall be tested for that service by a nationally recognized and accredited testing laboratory and shall bear the certification mark of the testing agency.

5. Classification

5.1 *Fittings*—This specification classifies fittings including manifolds, intended for use in systems with PEX tubing, by a maximum continuous use temperature that shall be 180°F (82°C) and by nominal sizes from ⅛ in. through 6 in. on the basis of resistance to burst pressure, hydrostatic sustained pressure, excessive temperature pressure capability, and by thermocycling. Fittings shall be compatible with tubing made to the requirements of Specification F876.

6. Requirements

6.1 *Workmanship*—Fittings shall be made from materials that are homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects. All sealing surfaces shall be smooth and free of foreign material. The walls of fittings and manifolds shall be free of cracks, holes, blisters, voids, foreign inclusions, or other defects that are visible to the naked eye and may affect fitting integrity.

6.2 *Dimensions and Tolerances:*

6.2.1 The dimensions and tolerances of fittings shall meet the specific requirements contained in Specifications F1807, F1865, F1960, F1961, F2080, F2159, F2434, and F2735 or other recognized specification.

6.2.2 Fittings shall be compatible with tubing made to the requirements of Specification F876.

6.3 *Corrosion Resistance*—Fittings shall be made from materials that are generally regarded as corrosion resistant.

6.3.1 Compliance with this specification requires that fittings contained in Specifications F1807, F1865, F1960, F1961, F2080, F2159, F2434, and F2735, and F2854 must meet the Performance and Test Method requirements of F877.

6.4 *Hydrostatic Burst:*

6.4.1 Tubing and fittings (tested as assemblies) assembled using the manufacturer's instructions shall meet the minimum hydrostatic burst requirements shown in Table 1 when tested in accordance with 7.6.

6.4.2 Manifolds with integral shut-offs (valves) shall be tested with all ports in the full-open or unrestricted position.

[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 American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, http://www.awwa.org.

[6] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://dodssp.daps.dla.mil.

[7] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.

TABLE 1 Burst Pressure Requirements for SDR9 PEX Tubing and System Component Assemblies

Nominal Tubing Size		Minimum Burst Pressures at Different Temperatures			
in.	mm	psi[A] at 73.4°F	(MPa) at (23°C)	psi[A] at 180°F	(MPa) at (82.2°C)
⅛	3	870	(6.00)	390	(2.69)
¼	7	752	(5.19)	336	(2.32)
⅜	10	620	(4.27)	275	(1.90)
½	13	480	(3.31)	215	(1.48)
⅝ and larger	16 and larger	475	(3.27)	210	(1.45)

[A] The fiber stress for SDR9 PEX tubing used to derive this test pressure is:
at 73.4°F (23.0°C) 1900 psi (13.10 MPa).
at 180°F (82.2°C) 850 psi (5.86 MPa).

6.4.2.1 If the manifold has more than one connection size, the test pressure selected from Table 1 shall be based upon the largest nominal PEX connection.

6.5 *Hydrostatic Sustained Pressure Strength*

6.5.1 Tubing and fittings (tested as assemblies) shall meet the minimum hydrostatic sustained pressure strength requirements shown in Table 2 when tested in accordance with 7.4.

6.5.1.1 Manifolds with integral shut-off (valves) shall be tested with all ports in the full-open or unrestricted position.

6.6 *Thermocycling:*

6.6.1 Fittings, assembled using the manufacturer's instructions, shall not leak after completion of 1000 cycles between the temperatures of 60°F (16°C) and 180°F (82°C) when tested in accordance with 7.5.

6.6.1.1 Manifolds with integral shut-offs (valves) shall be tested with all ports in the full open or unrestricted position.

6.7 *Excessive Temperature—Pressure Capability:*

6.7.1 *General*—In the event of a water heating system malfunction, PEX tubing and system components shall have adequate strength to accommodate short-term conditions, 48 h of 210°F (99°C), 150 psi (1034 kPa) until repairs can be made.

6.7.2 *Excessive Temperature Hydrostatic Sustained Pressure*—Tubing and system components, when tested as assemblies, shall not fail as defined in Test Method D1598 in less than 30 days (720 h) when tested in accordance with 7.7.

6.7.2.1 Manifolds with integral shut-offs (valves) shall be tested with all ports in the full open or unrestricted position.

NOTE 2—Tests applicable to assemblies and bends (6.4, 6.5, 6.6, and 6.7) are intended to be performance qualification tests and not tests required of each fitting.

TABLE 2 Minimum Hydrostatic Sustained Pressure Requirements for SDR9 PEX Tubing and System Component Assemblies[A,B]

Nominal Tubing Size		Pressure Required for Test, psi (MPa)[A]	
in.	mm	180°F	(82.2°C)
⅛	3	355	(2.45)
¼	7	305	(2.10)
⅜	10	250	(1.72)
½	13	195	(1.34)
⅝ and larger	16 and larger	190	(1.31)

[A] The fiber stress for SDR9 PEX tubing used to derive this test pressure is: 770 psi (5.31 MPa) at 180°F (82.2°C).
[B] Test duration is 1000 h.

7. Test Methods

7.1 *Conditioning*—The test specimens should be conditioned at 70 to 77°F (23 ± 2°C) and 50 ± 5 % relative humidity for not less than 40 h prior to test in accordance with Practice D618, for those tests where conditioning is required.

7.2 *Test Conditions*—Conduct the tests in the standard laboratory atmosphere of 70 to 77°F (23 ± 2°C) and 50 ± 5 % relative humidity, unless otherwise specified in the test methods or in this specification.

7.3 *Sampling*—A sufficient quantity of tubing and system components, as agreed upon by the purchaser and the seller, shall be selected and tested to determine conformance with this specification (see Practice D1898). In the case of no prior agreement, random samples selected by the testing laboratory shall be deemed adequate.

7.4 *Hydrostatic Sustained Pressure*— Determine in accordance with Test Method D1598, except for the following:

7.4.1 Test at least six joints, from randomly selected specimens assembled per the manufacturer's instructions with at least 5-pipe diameters between joints.

7.4.2 Test temperature shall be 180 ± 4°F (82 ± 2°C).

7.4.3 The external test environment shall be air or water.

7.4.4 Fill the specimens with water at a temperature of at least 120°F (50°C).

7.5 *Thermocycling:*

7.5.1 *Summary of Test Method*—This test method describes a pass-fail test for thermally cycling PEX tubing and system component assemblies over a critical temperature range for a selected number of cycles while subjected to a nominal internal pressure. This test method provides a measure of resistance to failure due to the combined effects of differential thermal expansion and creep for PEX tubing and fittings intended for continuous use up to and including 180°F (82°C).

7.5.2 *Apparatus*—A nitrogen or air source capable of maintaining a nominal internal pressure of 100 ± 10 psi (0.69 ± 0.069 MPa) on the specimens is required. The immersion system shall consist of two water reservoirs controlled at 60 ± 4°F (16± 2°C) and 180 ± 4°F (82 ± 2°C). The specimen shall be cycled from one reservoir to the other or the hot and cold water shall be alternately cycled over the test specimens automatically and returned to the proper reservoirs.

NOTE 3—Automatic cycling may be accomplished by pumping from each reservoir, through a delivery system having timer-actuated valves, to a specimen water trough having synchronized, timer-actuated return drains. Any automatic apparatus shall provide for complete immersion of the test specimen in the trough.

7.5.3 *Sampling and Specimen Preparation*— Select at least six joints from randomly selected specimens assembled per the manufacturer's instructions. Close the specimen assembly with any suitable end closures that allow "free-end" mounting and will not leak under the thermocycling conditions, and connect the specimen assembly to the pressure source.

7.5.4 *Procedure*—Pressurize the specimen assembly with nitrogen or air to 100 ± 10 psi (0.69 ± 0.069 MPa) . Immerse

in 60 ± 4°F (16 ± 2°C) water to determine if there are any initial leaks. All leaks shall be eliminated before the thermocycling test is started. Thermally cycle the specimen assembly either manually or automatically and under an internal pressure of 100 ± 10 psi (0.69± 0.069 MPa), alternately between 60 ± 4°F (16 ± 2°C) and 180 ± 4°F (82 ± 2°C) by means of immersion in water using the following test cycle:

Water immersion at 180°F (82°C)	2 min (min)
Air immersion at ambient	2 min (max)
Water immersion at 60°F (16°C)	2 min (min)
Air immersion at ambient	2 min (max)

Upon the completion of 1000 thermal cycles, immerse the specimen assembly again in 60 ± 4°F (16 ± 2°C) water and check for any sign of gas leakage. Any evidence of leakage at the fitting or separation of the fitting from the tubing constitutes a failure.

7.5.5 *Interpretation of Results*—Failure of any one of six joints tested shall constitute failure of this test.

7.6 *Hydrostatic Burst Strength*—Determine the minimum hydrostatic strength for tubing and system component assemblies at both 73°F (23°C) and 180°F (82°C) in accordance with Test Method D1599, except as herein specified.

7.6.1 *Procedure*—Select at least six joints from randomly selected specimens assembled per the manufacturer's instructions with at least 5-pipe diameters between joints. After assembly, attach end closures, fill the specimen assembly with water, and condition in water at the test temperature for 2 h min (or in air for 4 h min). In the case of testing at 180°F (82°C), the sample should be filled with water of at least 120°F (50°C) temperature prior to conditioning.

7.6.1.1 Increase the internal pressure at a constant rate so as to reach the maximum burst requirement in 60 to 70 s. Leakage or separation at any of the fittings tested, at less than the minimum hydrostatic burst requirements for either temperature specified in Table 1, shall constitute failure in this test.

7.7 *Excessive Temperature and Pressure Capability of Tubing and System Components:*

7.7.1 *Hydrostatic Sustained Pressure*— Determine in accordance with Test Method D1598, except for the following requirements:

7.7.1.1 Test at least six joints from randomly selected specimens assembled per the manufacturer's instructions with at least 5-pipe diameters between joints.

7.7.1.2 Condition the specimens in accordance with 7.1.

7.7.1.3 Test temperature shall be 210 ± 4°F (99 ± 2°C).

7.7.1.4 The external test environment shall be air.

7.7.1.5 Fill the specimens with water and condition for 2 h at a temperature of 210 ± 4°F (99 ± 2°C) and a pressure of 30 ± 3 psi (207 ± 21 kPa).

7.7.1.6 Pressurize test specimens to 150 psi (1034 kPa) and maintain for 30 days (720 h). The fiber stress used to derive this test pressure is 595 psi (4.1 MPa).

8. Retest and Rejection

8.1 If the results of any test(s) do not meet the requirements of this specification, the tests(s) shall be conducted again only by agreement between the purchaser and seller. Under such agreement, minimum requirements shall not be lowered, changed, or modified, nor shall specification limits be changed. If upon retest, failure occurs, the quantity of product represented by the test(s) does not meet the requirements of this specification.

9. Certification

9.1 PEX system components intended for use in the transport of potable water shall be evaluated and certified as safe for this purpose by a testing agency acceptable to the local health authority. The evaluation shall be in accordance with the requirements for chemical extraction, taste, and odor, that are no less restrictive than those included in NSF/ANSI Standard No. 14 and NSF/ANSI Standard No. 61. The seal or mark of the laboratory making the evaluation shall be included on the system components.

10. Marking

10.1 *Quality of Marking*—The marking shall be applied to system components in such a manner that it remains legible (easily read) after installation and inspection.

10.1.1 Markings or symbols may be rolled, molded, hot-stamped, etched or applied by printing methods.

10.1.2 Where recessed marking is used, the marking shall not cause cracks or reduce the wall thickness below the minimum requirement in the specific standard specification for the system component.

10.2 *Content of Marking:*

10.2.1 Manufacturer's name or trademark.

10.2.2 Certification mark or seal of the laboratory making the evaluation for this purpose.

10.2.3 This designation, F877 or the specified standard specification for the system component.

11. Quality Assurance

11.1 When the product is marked with this designation, F877 or the with the specific standard specification for the system component, 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.

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.

APPENDIXES

(Nonmandatory Information)

X1. HYDROSTATIC DESIGN STRESS

X1.1 Hydrostatic design stresses recommended by the Plastic Pipe Institute are used to pressure rate PEX plastic tubing. These design stresses are based on the 100 000-h hydrostatic strength of the tubing obtained in accordance with Test Method D2837. Additional information regarding the method of test and other criteria used in developing these hydrostatic design stresses may be obtained from the Plastics Pipe Institute at www.plasticpipe.org. See Table X1.1.

X1.2 Independent methods for determining the hydrostatic design stress of fittings have yet to be developed due to the complicating effects of fitting geometry. Instead, fittings and assembled systems carry an implied pressure rating equivalent to that of the corresponding tubing on the basis of actual equivalent hydrostatic performance of assembled systems for periods exceeding 10 000 h. The sustained pressure requirements of 6.5 for fittings tested as assembled systems are based on stress rupture data for tubing.

TABLE X1.1 Hydrostatic Design Stresses and Pressure Ratings for SDR9 PEX Distribution Systems

Rated Temperature		Hydrostatic Design Stress		Pressure Rating for Water	
°F	°C	psi	(MPa)	psi	(MPa)
73.4	23	630	(4.34)	160	(1.10)
180	82.2	400	(2.76)	100	(0.69)

X1.3 The hydrostatic design stresses are not suitable for materials that show a negative departure from a straight line plot of log versus stress versus log time to failure. All of the data available to date on PEX tubing materials and fitting assemblies, tested in accordance with Test Method D2837, meet this requirement. Experience of the industry indicates that PEX hot- and cold-water distribution systems made from components meeting the requirements of this specification give satisfactory service under normal conditions at these temperature-pressure ratings.

X2. DESIGN, ASSEMBLY, AND INSTALLATION CONSIDERATIONS

X2.1 Assembly

X2.1.1 *Compression-Type Fittings*—Assemble in accordance with the manufacturer's instructions. Compression-type fittings are likely to include inserts and ferrules, or O-rings which form an essential part of the fittings assembly and should not be omitted.

X2.1.1.1 *Insert Fittings*—A number of techniques have been developed where a fitting is firmly secured to PEX tubing. The fitting is placed inside the tube and a tool is employed to crimp a metallic lock ring around the tubing outside diameter adjacent to the fitting. This provides a mechanical lock with the tubing being wedged securely between the ring and the insert fitting.

X2.1.1.2 *Mechanical Fittings*—A number of fitting systems have been developed that can be described as mechanical compression-type joining. They are comprised of fittings that provide a seal on the outer surface of PEX tubing. The actual sealing is affected by the following methods:

(*A*) Elastomeric cone with threaded nut.

(*B*) Ferrule with a threaded nut.

The above compression-type fittings should be assembled in accordance with the manufacturer's recommendations.

X2.1.1.3 *Cold Flaring*—Utilize a cold flaring tool, wherein the tubing outside diameter is expanded mechanically. The expanded or flared end is then secured between a fitting. Flare configuration may vary depending on the particular tool employed. The flared surface generally serves as the sealing area between the tubing and fitting. See also Practice D3140.

X2.1.2 The manufacturer should be consulted regarding authorized fittings for use with PEX tubing.

X2.2 Installation

X2.2.1 *Storage and Handling*—PEX system components should be stored under cover to avoid unnecessary dirt accumulation and long-term exposure to sunlight. Care should be used in handling to ensure that unnecessary abuse, such as dropping on concrete, nicking or denting, is avoided.

X2.2.2 *Pressure Testing*—A pressure test with water at 100 psi (0.69 MPa) on the system excluding the hot water heater is advisable to test for fitting leakage.

X2.2.3 *Soldering in the Area*—Soldered metal fittings should not be made closer than 18 in. (460 mm) to an installed plastic-to-metal adapter in the same water line.

X3. OPTIONAL PERFORMANCE QUALIFICATION AND IN-PLANT QUALITY-CONTROL PROGRAM FOR PEX HOT-WATER DISTRIBUTION SYSTEM COMPONENTS

X3.1 Scope

X3.1.1 The following program covers performance qualification and in-plant quality control for component design and manufacture respectively to provide reasonable assurance that PEX hot-water distribution system components supplied under this specification shall consistently meet its requirements.

X3.2 Performance Qualifications

X3.2.1 Performance qualification tests shall be run initially on each component design, size, and formulation in accordance with the requirements of this specification. The test results shall be independently certified and shall be made available to the purchaser on request.

X3.3 In-Plant Quality Control

X3.3.1 *Material*—The tubing material shall be PEX as defined in Section 4 of this specification. The manufacturer shall so certify.

X3.3.2 *Quality-Control Testing*—Tubing and fitting quality-control tests shall be run for each extrusion line or mold cavity in accordance with the requirements of this specification at a frequency agreed upon between the purchaser and the manufacturer. The program outlined in Table X3.1 is recommended. The test results shall be recorded and filed for inspection on request. Should a component fail to meet the specification in any test, production should be sampled back to the previous acceptable test result and tested to determine which components produced in the interim do not meet the requirement. Components that do not meet the requirements of this specification shall be rejected. See Table X3.2.

X3.3.3 *Marking*—Fittings and manifolds shall be marked to identify the manufacturer and shall be coded or placed in dated containers to show the date of manufacture.

TABLE X3.1 Suggested Quality-Control Program

Component	Property	Frequency	Requirement
Fitting	Dimensions	hourly	6.2
	Burst pressure	daily	6.4

TABLE X3.2 Type Test Program

Component	Property	Requirement
Fittings	Sustained pressure	6.5
	Thermocycling	6.6
	Potable water	NSF/ANSI Standard No. 14
		NSF/ANSI Standard No. 61

SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F877–07) that may impact the use of this standard.

(1) Specification F2854 was added to Section 2.
(2) 4.1 was revised.
(3) 6.3.1 was revised.

Committee F17 has identified the location of selected changes to this standard since the last issue (F877–07) that may impact the use of this standard.

(1) Extensive revisions were made to the following Sections: 1, 3, 4, 5, 6, 9, and 10.
(2) Revisions were made to 7.3, 7.5.1, 7.6, and 7.7.1.6.
(3) Previous Table 1 was deleted.
(4) X1.1 was revised.
(5) Extensive revisions were made to Appendix X2.
(6) X3.3.3 was revised.
(7) Table X3.1 and Table X3.2 were revised.