Summary of Substantive Changes
between the 2018 and 2020 editions of
ASTM F877 "Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems"

Presented to the IAPMO Standards Review Committee on October 16, 2020

General: The changes to this standard should not have an impact on currently listed products. The substantive change are:

- Expanded the scope of applications for PEX systems covered by this standard and added a reference to PPI Technical Notes 52 and 53 on the use of PEX tubing for high temperature non-potable applications (see Sections 1.1, and 1.3)
- Expanded the scope to allow the use of stainless steel clamps for PEX tubing fittings, changes include materials, general, and dimensional requirements (see Sections 4.2, 6.1, and 6.3)
- Added the requirement to comply with NSF 14 for corrosion resistance (see Section 6.4)
- Added test specimen and conditioning requirements for some test procedures (see Sections 7.1, and 7.2)

Section 1, Scope: Expanded the scope of applications for PEX systems covered by this standards and added a reference to PPI Technical Notes 52 and 53 on the use of PEX tubing for high temperature non-potable applications as follows:

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 thermo-cycling 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, radiant ~~panel~~ heating and cooling systems, hydronic distribution ~~baseboard heating~~ systems, snow and ice melting systems, geothermal ground loops, district heating, turf conditioning, compressed air distribution and building services pipe.*

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. 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.

Section 2, Referenced Documents: The following standards were revised, deleted, or added as follows:
2.1 ASTM Standards:

~~*D1898 Practice for Sampling of Plastics (Withdrawn 1998)*~~
~~*D3140 Practice for Flaring Polyolefin Pipe and Tubing (Withdrawn 1999)*~~
~~*F1961 Specification for Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing (Withdrawn 2018)*~~
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
F3347 Specification for Metal Press Insert Fittings with Factory Assembled Stainless Steel Press Sleeve for SDR9 Cross-linked Polyethylene (PEX) Tubing
F3348 Specification for Plastic Press Insert Fittings with Factory Assembled Stainless Steel Press Sleeve for SDR9 Cross-linked Polyethylene (PEX) Tubing
2.2 ANSI Standards:
~~*Z 17.1 Preferred Numbers*~~
2.7 Plastic Pipe Institute Technical Notes:[7]
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

Section 3, Terminology: Definitions were revised and added as follows:
3.2 Definitions of Terms Specific to This Standard:
3.2.1 crosslinked polyethylene plastics— ~~*plastics prepared by crosslinking (curing) polyethylene compounds*~~ *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 ~~*an*~~ *appurtenances such as couplings, elbows,* ~~*or*~~ *tees, or plugs 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 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* ~~*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*~~*.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.

Section 4, Materials: Updated material references as follows:
4.2 Fitting and manifold materials shall meet the applicable requirements as described in Specifications F1807, ~~*F1865,*~~ *F1960,* ~~*F1961,*~~ *F2080, F2098, F2159, F2434, F2735, F2854, F3347 or F3348.*
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~~ testing laboratory that is accredited for this specification and shall bear the certification mark of the testing agency.

Section 5, Classification: Clarified classification requirements for fittings as follows:
5.1 Fittings—This specification classifies fittings, including ~~manifolds~~ system components, intended for use in systems with PEX tubing, by a maximum continuous use temperature that shall be 180 °F (82 °C) and by nominal tubing sizes (NTS) from 1⁄8 through 6 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.

Section 6, Requirements: Added a general requirement for all fittings contained in other ASTM referenced Standards to also comply with the requirements of Section 6 as follows:
~~6.3.1~~ 6.1 General—*Compliance with this specification requires that fittings contained in Specifications F1807, ~~F1865~~, F1960, ~~F1961,~~ F2080, F2098, F2159, F2434, F2735, F2854, F3347 and F3348 and system components must meet ~~the Performance and Test Method requirements of F877~~ all requirements of this section.*

Section 6.3, Dimensions and Tolerances: Added dimension and tolerance references, and removed F876 as an acceptable reference as follows:
~~6.2~~6.3 Dimensions and Tolerances:
~~6.2.1~~6.3.1 The dimensions and tolerances of fittings shall meet the specific requirements contained in Specifications F1807, F1960, F2080, F2098, F2159, F2434, F2735, F3347 and F3348 or other recognized specification.
~~6.2.2 Fittings shall be compatible with tubing made to the requirements of Specification F876.~~
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.

Section 6.4, Corrosion Resistance: Added the requirement to comply with NSF 14 for corrosion resistance as follows:
~~6.3~~6.4 Corrosion Resistance—Fittings *~~shall be made from materials that are generally regarded as~~ intended for potable water applications shall comply with dezincification resistance and stress* corrosion *cracking* resistance *requirements of NSF/ANSI Standard 14*.

Section 6.6, Hydrostatic Burst: Clarified hydrostatic sustained pressure strength requirements as follows:
~~6.5~~6.6 Hydrostatic Sustained Pressure Strength
~~6.5.1~~6.6.1 ~~Tubing and fittings (tested as assemblies)~~ System component assemblies shall meet the minimum hydrostatic sustained pressure strength requirements shown in Table 2 when tested in accordance with *~~7.4~~ 7.5. Test duration shall be 1000 h.*
~~6.5.1.1~~6.6.1.1 ~~Manifolds~~ System components with integral shut-off (valves) shall be tested with all ports in the full-open or unrestricted position.

~~6.6~~6.7 Thermocycling:
~~6.6.1~~6.7.1 ~~Fittings,~~ System components, 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~~7.6.

~~6.6.1.1~~6.7.1.1 ~~Manifolds~~ System components with integral shut-offs (valves) shall be tested with all ports in the full open or unrestricted position.

~~6.7~~6.8 Excessive Temperature/Pressure Capability—~~6.7.2 Excessive Temperature Hydrostatic Sustained Pressure–Tubing and s~~System component~~s~~ assemblies ~~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~~7.8.
~~6.7.1 General—~~NOTE 2—The rationale for test requirement 6.8 is so that in the event of a domestic hot-water 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.
~~6.7.2.1~~6.8.1 ~~Manifolds~~ System components with integral shut-offs (valves) shall be tested with all ports in the full open or unrestricted position.
NOTE ~~2~~ 3—Tests applicable to assemblies and bends (~~6.4~~6.5, ~~6.5~~6.6, ~~6.6~~6.7, and ~~6.7~~6.8) are intended to be performance qualification tests and not tests required of each fitting.

Section 7, Test Methods: Added test specimen and conditioning requirements as follows:
7.1 General—Sections 7.4, 7.5, 7.6, 7.7, and 7.8 shall use separate sets of assemblies for each test.
7.2 Conditioning—The test specimens should be conditioned at 73 ± 4 °F (23 ± 2 °C) and 50 ± 510 % 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~~7.3 Test Conditions—Conduct the tests in the standard laboratory atmosphere of 73 ± 4 °F (23 ± 2 °C) and 50 ± 5 % relative humidity, unless otherwise specified in the test methods or in this specification.

~~7.5~~7.6 Thermocycling:
~~7.5~~7.6 Summary of Test Method—This test method describes a pass-fail test for thermally cycling 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~~ system components intended for continuous use up to and including 180 °F (82 °C).

~~7.5.5~~7.6.5 Interpretation of Results—Failure of any one of the system component assemblies, including six joints tested, shall constitute failure of this test.

~~7.6.1.1~~7.7.1.1 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~~ joints tested, at less than the minimum hydrostatic burst requirements for either temperature specified in Table 1, shall constitute failure in this test.
~~7.7.1.6~~7.8.1.6 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).~~