



Designation: F2829 – 10

# Standard Specification for Metric-Sized Crosslinked Polyethylene (PEX) Pipe Systems<sup>1</sup>

This standard is issued under the fixed designation F2829; 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.

## 1. Scope

1.1 This specification covers performance requirements, test methods, and marking requirements for metric-sized system components (electrofusion and mechanical fittings) when joined with metric-sized PEX pipe (Specification F2788) as a system, intended for use up to and including a maximum working temperature of 200°F (93°C). The following performance requirements are described for the fittings – 68°F (20°C) hydrostatic strength, 176°F (80°C) hydrostatic strength, short-term internal pressure resistance, resistance to tensile loads, cohesive resistance for electrofusion fittings at both the minimum and maximum recommended temperatures, impact resistance for saddle fittings, and leak tightness and pull out tests for mechanical fittings. The metric-sized components covered by this specification are intended for the above-ground and buried pressure piping applications, such as industrial & general-purpose pipelines, potable water pipelines, and fire – extinguishing pipelines.

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.

1.3.1 *Exception*—Except for dimensions, the values stated in inch-pound units are to be regarded as standard. The values given in parentheses for nominal sizes are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

NOTE 1—Metric sized (SI units) pipe (Specification F2788) should only be joined with corresponding metric sized fittings (such as Specification F2788, ISO 4427-3 or ISO 15875-3). Inch sized fittings should not be used for metric-sized pipe.

NOTE 2—Suggested hydrostatic design stresses and hydrostatic pressure ratings for pipe 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:<sup>2</sup>

D618 Practice for Conditioning Plastics for Testing

D1600 Terminology for Abbreviated Terms Relating to Plastics

D1898 Practice for Sampling of Plastics (Withdrawn 1998)<sup>3</sup>

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

F1055 Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing

F2788 Specification for Metric and Inch-sized Crosslinked Polyethylene (PEX) Pipe

### 2.2 Federal Standard:<sup>4</sup>

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

### 2.3 Military Standard:<sup>4</sup>

MIL-STD-129 Marking for Shipment and Storage

### 2.4 NSF Standard:<sup>5</sup>

Standard No. 14 for Plastic Piping Components and Related Materials

NSF/ANSI 61 Drinking Water System Components -- Health Effects

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

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

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

<sup>5</sup> Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, <http://www.nsf.org>.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.61 on Water. Current edition approved Dec. 1, 2010. Published January 2011. DOI: 10.1520/F2829-10.

### 2.5 ISO Standards:<sup>6</sup>

**ISO 4427-3** Plastic piping systems – Polyethylene (PE) pipes and fittings for water supply – fittings

**ISO 4427-5** Plastic piping systems – Polyethylene (PE) pipes and fittings for water supply – fitness for purpose of the system

**ISO 15875-3** – Plastic piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) – fittings

**ISO 15875-5** – Plastic piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) – fitness for purpose of the system

### 2.6 Plastic Pipe Institute:<sup>7</sup>

**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 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.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *crosslinked polyethylene, n*—a type of plastic derived from a polyethylene base resin in which adjacent chains of the polymer are joined to create covalent bonds.

## 4. Materials

4.1 *General*—PEX systems shall use crosslinked polyethylene pipe as described in Specification **F2788**.

4.2 *Electrofusion fittings*—PE electrofusion fittings shall only be used to join to PEX pipe for temperatures up to 140°F (60°C). For higher temperatures, only PEX electrofusion fittings shall be used.

4.3 System components shall meet the applicable requirements for materials and manufacture in applicable fitting standards, such as Specification **F1055**, ISO 4427-3 and ISO 4427-5, for PE electrofusion and mechanical fittings joined to PEX pipe for temperatures up to 140°F (60°C), or in ISO 15875-3 and ISO 15875-5 for PEX electrofusion fittings and mechanical fittings joined to PEX pipe for temperatures up to 200°F (93°C). Since Specification **F2788** PEX pipe sizes are all metric sizes, only metric-sized fittings, complying with and marked as Specification **F1055**, ISO 4427-3 and ISO 15875-3 or other applicable standard, shall be used.

4.4 *Certification*—PEX fittings 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.

<sup>6</sup> Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.

<sup>7</sup> Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.

## 5. Classification

5.1 *Fittings*—This specification classifies fittings intended for use in systems with PEX pipe, by a maximum continuous use temperature that shall be 200°F (93°C) and by pipe sizes from 16 mm to 630 mm (½ in. to 25 in.) on the basis of meeting the performance requirements for fittings as outlined in Specification **F1055**, ISO 4427-3 and ISO 15875-3. Fittings shall be compatible with pipe made to the requirements of Specification **F2788**.

5.2 PE electrofusion fittings (Specification **F1055** or ISO 4427-3) shall only be used for temperatures up to 140°F (60°C). PEX electrofusion fittings (ISO 15875-3) may be used for temperatures up to 200°F (93°C).

## 6. Requirements

### 6.1 Dimensions and Tolerances:

6.1.1 The dimensions and tolerances of PE electrofusion and mechanical fittings used up to 140°F (60°C) shall meet the specific requirements contained in Specification **F1055** and ISO 4427-3. The dimensions and tolerances of PEX electrofusion fittings and mechanical fittings for temperatures up to 200°F (93°C) shall meet the specific requirements contained in ISO 15875-3. Fittings shall be compatible with pipe made to the requirements of Specification **F2788**.

6.2 *Electrofusion Joints*—All electrofusion joints shall meet all the performance requirements as specified in Specification **F1055**, ISO 4427-3, and ISO 4427-5 for temperatures up to 140°F (60°C), or ISO 15875-3 and ISO 15875-5 for temperatures up to 200°F (93°C). Performance tests for electrofusion joints between PEX pipe and PE electrofusion fittings shall follow the relevant standard to which the EF fitting complies, either Specification **F1055** or ISO 4427-3. The following are examples of the performance requirements are as 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.

6.3 *Mechanical Joints*—All mechanical fitting joints made between metric-sized PEX pipe and metric-sized mechanical fittings shall meet the performance requirements as specified in ISO 4427-3 and ISO 4427-5 for temperatures up to 140°F (60°C), or ISO 15875-3 and ISO 15875-5 for temperatures up to 200°F (93°C). The following performance requirements are described in these ISO standards for mechanical fittings – 68°F (20°C) hydrostatic strength, 176°F (80°C) 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.

## 7. Test Methods

7.1 *Conditioning*—The test specimens should be conditioned at 70 to 77°F (23 ± 2°C) and 50 ± 5 % relative