



Standard Specification for Flexible Pre-Insulated Piping¹

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INTRODUCTION

This specification covers materials and test methods for flexible, pre-insulated piping with non-bonded insulation. For the purpose of this standard, flexible pre-insulated piping system shall refer to a piping system that is supplied complete with carrier pipe, thermal insulation, and outer jacket manufactured as an integrated system, and is supplied in a coil. This specification covers the requirements, material specifications, and test methods of piping systems intended to convey hot and cold fluids. Piping systems may include one or more carrier pipes within a common outer jacket.

1. Scope

1.1 This specification covers flexible, pre-insulated piping commonly used to convey hot and cold fluids.

1.2 This specification establishes materials and performance requirements for flexible, pre-insulated piping intended for hot and chilled water applications.

1.3 Piping systems may include one or more carrier pipes within a common outer jacket.

1.4 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered part of this standard.

1.5 *Units*—The values stated in either inch-pound units or SI 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 of the standard.

1.6 The following safety hazards caveat pertains to the test methods 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 requirements prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

C 168 Terminology Relating to Thermal Insulation²

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus²

D 1600 Terminology for Abbreviated Terms Relating to Plastics³

D 2104 Specification for Polyethylene (PE) Plastic Pipe, Sch. 40⁴

D 2239 Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter⁴

D 3035 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter⁴

F 412 Terminology Relating to Plastic Piping Systems⁴

F 714 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter⁴

F 876 Specification for Crosslinked Polyethylene (PEX) Tubing⁴

F 877 Specification for Crosslinked (PEX) Plastic Hot and Cold Water Distribution Systems⁴

F 1281 Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe⁴

F 1282 Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe⁴

2.2 NSF Standards:

ANSI/NSF 14 Plastics and Plumbing System Components⁵

ANSI/NSF 61 Drinking Water System Components—Health Effects⁵

2.3 DIN Standards⁶:

DIN 8074 Polyethylene (PE) Pipes, PE 63, PE 80, PE-100, PE-HD—General Quality Requirements and Testing

¹ This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.11 on Composites.

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² *Annual Book of ASTM Standards*, Vol 04.06.

³ *Annual Book of ASTM Standards*, Vol 08.01.

⁴ *Annual Book of ASTM Standards*, Vol 08.04.

⁵ Available from NSF International, 789 Dixboro Road, Ann Arbor, MI 48105.

⁶ Available from DIN Deutsches Institut für Normung e.V., 10772 Berlin, Germany.

DIN 8075 Polyethylene (PE) Pipes, PE 63, PE 80, PE-100, PE-HD—Dimensions
 DIN 16892 Crosslinked Polyethylene Pipes—General Quality Requirements and Testing
 DIN 16893 Crosslinked Polyethylene Pipes—Dimensions

3. Terminology

3.1 Definitions are in accordance with Terminology F 412 for plastic piping systems and C 168 for thermal insulating materials; abbreviations are in accordance with Terminology D 1600 unless otherwise indicated.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *bonded insulation system, n*—a product that is the result of applying thermal insulation to a carrier pipe where a bond forms between the insulation and the carrier pipe that exceeds the modulus of elasticity of the carrier pipe.

3.2.2 *carrier pipe, n*—the pipe(s) that are used to convey the medium.

3.2.3 *crosslinked polyethylene (PEX) plastic, n*—plastic prepared by crosslinking (curing) polyethylene compounds.

3.2.4 *end seal, n*—a device that provides a seal between the outer jacket and carrier pipe, providing a moisture barrier for the insulation.

3.2.5 *flexible pre-insulated pipe system, n*—a factory manufactured pre-insulated pipe system consisting of carrier pipe(s), thermal insulating material, and protective jacket. This product is supplied in coils.

3.2.6 *jacket, n*—the outer covering of the flexible pre-insulated pipe system. The jacket provides mechanical and moisture protection for the insulation.

3.2.7 *non-bonded insulation system, n*—a product that is the result of applying thermal insulation to a carrier pipe without bonding the insulation to the carrier pipe, allowing the carrier pipe to move freely within the insulation.

3.2.8 *pipe joint, n*—a connection between two sections of piping material. The pipe joint shall include the connection of the carrier pipe, insulation of the bare section carrier pipe, and protective outer jacket.

3.2.9 *thermal insulation, n*—a general term used to describe any material that reduces heat transfer.

3.2.10 *ultraviolet (UV) stability, n*—the resistance to ultraviolet degradation of the jacket material.

4. Significance and Use

4.1 This specification establishes materials and performance requirements for flexible, pre-insulated piping intended for hot and chilled water applications.

4.2 The bending force test ensures that the installer will obtain materials that will be suitable for installation as flexible piping.

5. Materials

5.1 Carrier Pipe(s):

5.1.1 PEX carrier pipe shall conform to one or more of the following: Specifications F 876, F 877; DIN 16892 or DIN 16893.

5.1.2 PE carrier pipe shall conform to one or more of the following: Specifications D 2104, D 2239, D 3035, F 714; DIN 8075 or DIN 8074.

5.1.3 Composite carrier pipe shall confirm to Specifications F 1281 or F 1282.

5.1.4 Other piping materials as specified by customer specifications.

5.2 Thermal Insulation:

5.2.1 Insulation shall have a maximum thermal conductivity of 0.30 BTU·in./h·ft²·°F (0.04 W/(m·K)) when measured in accordance with Test Method C 177.

5.2.2 All seams of the insulation shall be sealed.

5.2.3 Insulation shall be visually inspected for voids and other defects prior to the application of the jacket. Any voids or variance in thickness greater than 0.1 in. shall be reason for rejection. Manufacturer shall repair or replace defective insulation before product is shipped to the customer. Channels for heat trace, control wiring, or orientation markings are excluded from this requirement.

5.2.4 Insulation shall not be bonded to the carrier pipe.

5.3 Outer Jacket:

5.3.1 The outer jacket shall be constructed of a watertight, corrugated material.

5.3.2 The outer jacket shall contain 2 weight percent carbon black, finely divided and thoroughly dispersed to provide protection from UV degradation.

5.4 Materials to join sections of the carrier pipe or to transition to other piping materials shall be supplied by the system supplier and shall be one of the following types:

5.4.1 Compression Fittings, or

5.4.2 Heat-Fusion Welding.

5.5 The system supplier shall supply insulation and cover for any joints.

6. Requirements

6.1 The system shall be supplied in coil form. Carrier-pipe, thermal-insulation, and protective-jacket material shall be continuous and uniform throughout the coil. Connections and joints in the carrier pipe and the protective jacket shall not be allowed within the coil.

6.2 End Seals:

6.2.1 End seals shall be installed at all terminal ends of each section of piping.

6.2.2 End seals shall be watertight after being subjected to an external-pressure equivalent to a 20 ft water column for 48 h, as described in 7.1.

NOTE 1—Experience has shown that the oxygen barrier of PEX piping systems can be damaged by excessive heat being applied to heat-shrink materials during installation.

6.3 Outer Jacket:

6.3.1 The outer jacket diameter shall be determined by measuring the outside diameter of the jacket. In the case of corrugated jacket, the outside diameter of the corrugation shall be measured.

6.3.2 The outer jacket thickness shall be based on outer diameter of the jacket. Outer jacket thickness shall be as in Table 1.

7. Test Methods

7.1 End Seal Testing: