



Standard Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Pipe, Tubing and Systems to Hot Chlorinated Water¹

This standard is issued under the fixed designation F2023; 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 test method describes the general requirements for evaluating the long-term, chlorinated water, oxidative resistance of cross-linked polyethylene (PEX) pipe or tubing produced in accordance with PEX specifications, such as Specification **F876** or Specification **F2788/F2788M** by exposure to hot, chlorinated water. This test method outlines the requirements of a pressurized flow-through test system, typical test pressures, test-fluid characteristics, failure type, and data analysis.

NOTE 1—Other known disinfecting systems (chlorine dioxide, ozone, and chloramines) are also used for protection of potable water. Free-chlorine is the most common disinfectant in use today. A PPI research project examined the relative aggressiveness of free chlorine and chloramines on PEX pipes, both at the same 4.0 ppm concentration and the same test temperatures. The results of the testing showed pipe failure times approximately 40% longer when tested with chloramines compared to testing with free chlorine, at the tested conditions. Based on these results, the data suggests that chloramines are less aggressive than free chlorine to PEX pipes.

1.2 Guidelines and requirements for test temperatures, test hoop stresses, and other test criteria have been established by prior testing of PEX pipe or tubing produced by the three most common commercial methods of cross-linking: silane, peroxide, and electron-beam (see **Note 2**). Other related system components that typically appear in a PEX hot-and-cold water distribution system can be evaluated with the PEX pipe or tubing. When testing PEX pipe or tubing and fittings as a system, it is recommended that the anticipated end-use fitting type(s) and material(s) be included in the test circuit since it is known that some fitting types and materials can impact failure times. Specimens used shall be representative of the piping product(s) and material(s) under investigation.

NOTE 2—The procedures described in this test method (with some modifications of test temperatures or stresses, or both) have been used to

evaluate pipes manufactured from polybutylene (PB), polyethylene (PE), polypropylene (PP), multilayer (polymer-metal composite), copper, and stainless steel.

1.3 This test method is applicable to PEX pipe or tubing and systems used for transport of potable water containing free-chlorine for disinfecting purposes. The oxidizing potential of the test-fluid specified in this test method exceeds that typically found in potable water systems across the United States.

1.4 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.

1.5 The following precautionary caveat pertains only to the test method portion, Section **12**, 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

D1600 Terminology for Abbreviated Terms Relating to Plastics

D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

F412 Terminology Relating to Plastic Piping Systems

F876 Specification for Crosslinked Polyethylene (PEX) Tubing

F2788/F2788M Specification For Metric and Inch-sized Crosslinked Polyethylene (PEX) Pipe

2.2 ISO Standards:

ISO 9080 Thermoplastic Pipe for Transport of Fluids—Methods of Extrapolation of Hydrostatic Stress Rupture Data to Determine the Long Term Strength of Thermoplastic Pipe

¹ This test method is under the jurisdiction of ASTM Committee **F17** on Plastic Piping Systems and is the direct responsibility of Subcommittee **F17.40** on Test Methods.

Current edition approved Dec. 1, 2015. Published January 2016. Originally approved in 2000. Last previous edition approved in 2013 as F2023 – 13. DOI: 10.1520/F2023-15.

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.