Designation: F 1924 – 01ε1

An American National Standard

Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing[1]

This standard is issued under the fixed designation F 1924; 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.

ε[1] NOTE—Section 10 was editorially updated in December 2002.

1. Scope

1.1 This specification describes requirements and test methods for the qualification of plastic bodied mechanical fittings for use with outside diameter controlled polyethylene (PE) gas distribution pipe, nominal 2 pipe size (IPS) and smaller complying with Specification D 2513. In addition, it specifies general requirements of the material from which these fittings are made.

1.2 The test methods described in this specification are not intended to be used as routine quality control tests.

1.3 This specification covers the types of mechanical fittings described in 3.2.1.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 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.*

1.6 The text of this specification references notes and footnotes, which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this specification.

2. Referenced Documents

2.1 *ASTM Standards:*

D 638 Test Method for Tensile Properties of Plastics[2]

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure[3]

D 1600 Terminology for Abbreviated Terms Relating to Plastics[2]

D 2513 Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings[3]

D 2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials[3]

F 412 Terminology Relating to Plastic Piping Systems[3]

F 1588 Test Method for Constant Tensile Load Joint Test (CTLJT)[3]

2.2 *ASME Standard:*

ASME B31.8 Gas Transmission and Distribution Piping Systems[4]

2.3 *Federal Standard:*

CFR, Title 49, Part 192 Pipeline Safety Regulations[5]

2.4 *Plastics Pipe Institute Standard:*

PPI TR-4 Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds[6]

3. Terminology

3.1 *Definitions*—Definitions of terms used in this specification are in accordance with Terminology F 412 unless otherwise specified. Abbreviations are in accordance with Terminology D 1600 unless otherwise specified.

3.1.1 The Gas Industry terminology used in this specification is in accordance with ASME B31.8 or CFR, Title 49, Part 192 unless otherwise indicated.

3.1.2 The term "pipe" used herein refers to both "pipe" and "tubing" unless specifically stated otherwise. The term "fitting" refers to a mechanical connecting device as described in 3.1.4 and 3.1.6.

3.1.3 *joint, n*—the location at which two pieces of pipe, or a pipe and a fitting are connected together, for example, an installed coupling has two joints.

3.1.4 *joint, mechanical, n*— a connection between piping components employing physical force to develop a seal or produce alignment.

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.60 on Gas.

Current edition approved Oct. 10, 2001. Published January 2002.Orginally published as F 1924–98. Last previous edition F 1924–98.

[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 08.04.

[4] Available from American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016–5990.

[5] Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

[6] Available from Plastics Pipe Institute, 1801 K Street NW, Suite 600K, Washington, DC 20402.

3.1.5 *long-term strength (LTS), n*—the estimated tensile stress that when applied continuously will cause failure at 100 000 h. This is the intercept of the stress regression line with the 100 000 h coordinate.

3.1.6 *mechanical fitting, n*—fitting for making a mechanical joint to provide for pressure integrity, leak tightness, and depending on category, as defined in this specification, resistance to end loads.

3.1.6.1 *category 1 mechanical fitting, n*—fitting for assembling pipes, which includes a compression zone(s) to provide for pressure integrity, leak tightness, and resistance to end loads sufficient to cause no less than 25 % elongation of the PE piping as described in this specification.

3.1.6.2 *category 2 mechanical fitting, n*—fitting for assembling pipes, which includes a compression zone(s) to provide for pressure integrity and leak tightness only. Category 2 fittings do not provide for resistance to end loads.

3.1.7 *MAOP, n*—the Maximum Allowable Operating Pressure of the fuel gas piping system, in psig, as determined in accordance with CFR, Title 49, Part 192.121 and as represented in the following:

$$MAOP = P = 2 \times S/(R-1) \times f_D \quad (1)$$

where:

S = the PE material's HDB as published in PPI TR-4.

R = the pipe's dimension ratio determined by dividing the pipe's specified nominal outside diameter by the pipes specified nominal wall thickness; and,

f_D = the design (derating) factor for thermoplastic fuel gas piping as set by the authority having jurisdiction. In the United States the design factor is cited in CFR, Title 49 Part 192.121.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *Types of Mechanical Fittings:*

3.2.2 *in-line fitting, n*—mechanical fitting used to make a mechanical joint where the bore axis of the compression and sealing zones of the fitting is essentially the same as the connected piping, for example, couplings, ells, and tees.

3.2.3 *mechanical saddle fitting, n*—mechanical fitting used to make a mechanical joint that allows a lateral connection to an existing main in which a portion of the fitting is contoured to match the O.D. of the pipe to which it is attached. Herein referred to as the *saddle fitting mating pipe*.

4. Materials and Manufacture Requirements

4.1 Plastic pressure containing materials subject to continuous stress, either hoop or axial, shall have an ASTM material specification, and the materials long-term strength, such as the long-term hydrostatic strength, determined in accordance with Test Method D 2837, excepting that failure data can be obtained from specimens such as the following: tensile bars, plane strain, or actual fitting samples. A material listing in PPI TR-4 document is evidence of compliance with this paragraph for third party certifying and listing agencies.

4.2 The physical properties of each material used to produce the fitting shall be available from the fitting manufacturer upon request.

4.3 Specifications outlining all the physical properties and effects of environmental conditions for materials of manufacture shall be available from the fitting manufacturer upon request.

NOTE 1—Materials in long-term contact with natural gas of line quality and LP gas vapor should be demonstrated not to adversely affect the performance of the fitting.

NOTE 2—Materials should have a demonstrated resistance to environmental stress cracking when exposed, under stress, to chemical compounds encountered in, or external to gas piping systems, and a demonstrated resistance to bacteriological decomposition. Such compounds include, but are not limited to, ice thawing chemicals, fertilizers, insecticides, herbicides, leak detection fluids, acids, bases and antifreeze solutions used to thaw frozen lines. The effects of liquid environments, such as antifreeze agents, odorants, and hydrocarbons are known to be deleterious to some plastics, particularly when under service conditions.

5. Dimensions

5.1 The dimensions and tolerances shall be determined by the manufacturer.

6. Qualification Requirements

6.1 *General*—Unless otherwise specified, each nominal size of fitting shall be tested. Testing of the thickest wall pipe that the fitting is designed to be used with qualifies the use of that fitting with pipe of lesser wall thickness.

6.1.1 Mechanical joint qualifications shall be performed on assembled joints using the fitting manufacturer's joining procedure. All mechanical fittings offered by the manufacturer shall be capable of meeting the requirements of this standard when connecting polyethylene gas piping complying with Specification D 2513. To verify the structural integrity of the fitting body, representative samples shall be subjected to the requirements of 6.2.1. It is not the intent of this specification to require testing of all fitting configurations, that is, tees, ells, etc., but each mechanical joint design in each size.

6.1.2 All mechanical fittings described in 3.2.1 shall have an internal pipe reinforcing tubular insert stiffener that extends at least under the seal and gripping device, where used. The saddle portion of saddle-type fittings do not require an internal tubular stiffener due to the nature of the connection.

6.2 *Performance Requirements*:

6.2.1 *Elevated Temperature Sustained Pressure*—The fitting, joint or pipe in the area affected by the fitting shall not fail as defined in Test Method D 1598, when tested in accordance with 7.2. The fitting or joint meets this requirement when tested in accordance with any one of the three conditions (A, B, or C) listed in 7.2.

6.2.2 *Tensile Strength*—The pipe joint shall accommodate the tensile loadings when tested in accordance with 7.3.

6.2.2.1 *In-Line Fittings, Category 1*—The joint shall provide resistance to a force on the pipe joint equal to or greater than that which will cause no less than 25 % elongation of pipe, or the pipe fails outside the joint area when tested in accordance with 7.3.

6.2.2.2 *In-Line Fittings, Category 2*—A joint design that provides a seal only. A mechanical joint designed for this category excludes any provisions in the design of the joint to resist any axial pullout forces; therefore, tensile tests are not required.