



Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing¹

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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 D2513. 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.

1.4 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 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:²

D638 [Test Method for Tensile Properties of Plastics](#)

D1598 [Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure](#)

D1600 [Terminology for Abbreviated Terms Relating to Plastics](#)

D2513 [Specification for Polyethylene \(PE\) Gas Pressure Pipe, Tubing, and 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](#)

F1588 [Test Method for Constant Tensile Load Joint Test \(CTLJT\)](#) ~~Test Method for Constant Tensile Load Joint Test (CTLJT)~~

F2897 [Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components \(Pipe, Tubing, Fittings, Valves, and Appurtenances\)](#)

2.2 ASME Standard:

ASME B31.8 [Gas Transmission and Distribution Piping Systems](#)³

2.3 Federal Standard:

CFR, Title 49, Part 192 [Pipeline Safety Regulations](#)⁴

2.4 Plastics Pipe Institute Standard:

PPI TR-4 [Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds](#)⁵

3. Terminology

3.1 *Definitions*—Definitions of terms used in this specification are in accordance with Terminology F412 unless otherwise

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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.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, http://www.asme.org.

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

⁵ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.

*A Summary of Changes section appears at the end of this standard.

specified. Abbreviations are in accordance with Terminology D1600 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.

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:

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

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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 *Types of Mechanical Fittings:*

3.2.1 *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.

3.2.2 *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 D2837, 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.