



Standard Test Method for Time-to-Failure of Plastic Piping Systems and Components Under Constant Internal Pressure With Flow¹

This standard is issued under the fixed designation F 948 ; 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 covers the determination of the time-to-failure of plastic piping products under constant internal pressure and flow.

1.2 This test method provides a method of characterizing plastics in the form of pipe, components, and systems under any reasonable combination of internal and external temperatures and environments, under the procedures described.

1.3 This test method can be used to characterize the tested plastic materials or products, or both, on the basis of pressure-, or stress-rupture data developed under the conditions prescribed.

1.4 The values stated in inch-pound units are to be regarded as the standard.

1.5 *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:

- D 543 Test Method for Resistance of Plastics to Chemical Reagents²
- D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings³
- D 2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials³
- D 2992 Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings³
- D 3567 Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings³
- E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁴

¹ This test method is under the jurisdiction of ASTM Committee F-17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.40 on Test Methods.

Current edition approved April 15, 1994. Published June 1994. Originally published as F 948 – 85. Last previous edition F 948 – 85.

² Annual Book of ASTM Standards, Vol 08.01.

³ Annual Book of ASTM Standards, Vol 08.04.

⁴ Annual Book of ASTM Standards, Vol 14.02.

2.2 PPI Documents:

TR-2 Policies and Procedures for the Listing of Thermoplastic Pipe, Fittings, and Fixture Materials When Evaluated Under Constant Internal Pressure With Flow⁵

TR-3 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials⁵

3. Terminology

3.1 Definitions:

3.1.1 *failure*—bursting, cracking, splitting, or weeping (seepage of test fluid through the wall of the product) during the test, which results in the inability of the specimen to maintain pressure or contain the internal test fluid, shall constitute failure of the test specimen. Failure may sometimes occur by ballooning, an excessive extension leading to structural failure. When failure occurs by ballooning the degree of distension should be recorded. Assemblies may also fail to joint leakage or separation.

NOTE 1—Overall distension, which results from creep caused by long-term stress, is not considered to be a ballooning failure.

3.1.2 *hoop stress*—the tensile stress in the wall of the piping product in the circumferential direction due to internal pressure. Units will be reported as pounds per square inch (psi) or mega pascals (MPa). Hoop stress will be calculated by the following ISO equation:

$$S = P(D - t)/2t$$

where:

S = hoop stress, psi (MPa),
 D = average outside diameter, in. (mm),
 P = internal pressure, psig (MPa), and
 t = minimum wall thickness in. (mm).

NOTE 2—Hoop stress should only be determined on straight hollow cylindrical specimens. Products of more complex shape may be evaluated by Option 2 of Appendix X1 based on pressure.

3.1.3 *make-up fluid*—an exchange of internal fluid with fresh fluid at a minimum rate of 10 % of the total system volume per week.

3.1.4 *maximum internal surface temperature*—that

⁵ Available from Plastics Pipe Institute, Division of The Society of the Plastics Industry, 250 Park Avenue, New York, NY 10017.