



Standard Test Method for Time-to-Failure of Plastics Using Plane Strain Tensile Specimens¹

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1. Scope

1.1 This test method covers the requirements to determine the time-to-failure of thermoplastic resins for piping applications by uniaxial loading of a grooved tensile test specimen. This grooved tensile specimen achieves a multi-axial stress condition, which mimics the stress condition found in pressurized solid-wall plastic pipe. The ratio of the stress in the axial direction to the transverse direction approximates that for a pressurized solid-wall pipe specimen.

1.2 It is intended that the data generated on these specimens be analyzed according to the methodology set forth in Test Method **D2837** to generate a long-term strength design value for the material.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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

D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D1600 Terminology for Abbreviated Terms Relating to Plastics

D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

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.

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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.

D2990 Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

D1928 Practice for Preparation of Compression-Molded Polyethylene Test Sheets and Test Specimens (Withdrawn 2001)³

D4703 Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets

F412 Terminology Relating to Plastic Piping Systems

2.2 *Other Document:*

PPI TR-4 HDB Listed Materials⁴

3. Terminology

3.1 Definitions:

3.1.1 Definitions are in accordance with Terminology **F412**, and abbreviations are in accordance with Terminology **D1600**.

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

4. Summary of Test Method

4.1 This test method consists of a description of the grooved tensile test specimen and its use in various environments to obtain the long-term strength capacity for piping materials. Such a controlled environment may be accomplished by, but is not limited to, immersing the specimens in a controlled-temperature water bath or circulating-air oven.

5. Significance and Use

5.1 The data obtained by this test method are useful for establishing stress versus failure-time relationships in a controlled environment. The long-term strength (LTS) is determined primarily for materials used in molding applications. The LTS categorized in accordance with Table 1 of ASTM **D2837** is known as the SDB (strength design basis).

NOTE 1—These SDB values will be published in PPI TR-4 for materials used in molding applications only.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.