



Standard Test Method for Slow Crack Growth Resistance of Notched Polyethylene Plastic Pipe¹

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1. Scope

1.1 This test method determines the resistance to slow crack growth^{2,3} of polyethylene pipe expressed in terms of time to failure of the pipe with machined axial notches in a hydrostatic stress rupture test.

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

1.3 *This standard does not purport to address all of the safety problems, 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.*

NOTE 1—A similar test method is described in ISO 13479.

2. Referenced Documents

2.1 ASTM Standards:

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure⁴

D 1600 Terminology for Abbreviated Terms Relating to Plastics⁵

D 2122 Method for Determining Dimensions of Thermoplastic Pipe and Fittings⁴

F 412 Terminology Relating to Plastic Piping Systems⁴

2.2 ISO Standards:

ISO 1167 Plastics pipes for the transport of fluids—Determination of resistance to Internal Pressure⁶

ISO 3126 Plastics pipes—Measurement of dimensions⁶

ISO 13479 Polyolefin Pipes for the Conveyance of Fluids—Determination of Resistance to Crack Propagation—Test Method for Slow Crack Growth on Notched Pipes (Notch Test)⁶

3. Terminology

3.1 General—Definitions are in accordance with Terminologies in F 412, unless otherwise specified. Abbreviations are in accordance with Terminology D 1600.

4. Significance and Use

4.1 Pipe test samples with four external axial machined notches are subjected to a constant pressure hydrostatic stress rupture test while immersed in a water tank at 80°C (176°F). The time to failure is recorded. The test is applicable to pipe of wall thickness >0.2 in. (5 mm).

5. Apparatus

5.1 *Pipe Test Equipment*, as described in ISO 1167 or Test Method D 1598.

5.2 *Milling Machine*, which has a horizontal mandrel rigidly fixed to the bed to enable the pipe to be securely clamped to give a straight specimen. The mandrel shall support the pipe bore beneath and along the full length of the notch to be machined. The milling cutter mounted on a horizontal arbor shall be a 60° included angle 'V' cutter, 0.5 in. (12.5 mm) wide having a cutting rate of 0.00040 ± 0.00008 in. ($0.010 + 0.002$ mm)/rev/tooth.

NOTE 2—For example a cutter with 20 teeth rotating at 700 rpm, traversed along at a speed of 6 in./min (150 mm/min) has a cutting rate as follows:

$$6/(20 \times 700) = 0.00042 \text{ (in./rev)/tooth}$$

$$150/(20 \times 700) = 0.011 \text{ (mm/rev)/tooth}$$

6. Procedure

6.1 *Specimen Preparation*—Take a pipe sample with a minimum free length between the end caps of $3 \times$ pipe outside diameter ± 0.2 in. (5 mm).

6.1.1 Pipe Measurement:

6.1.1.1 The minimum pipe wall thickness shall be located and marked for machining the initial notch.

6.1.1.2 The positions shall be marked for machining three additional notches equally spaced around the pipe circumference at the same axial position as the initial notch (see Fig. 1).

6.1.1.3 The average wall thickness shall be recorded from measurements taken at either end of the specimen in line with the positions for each of the four notches.

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.

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² Denning, J. A., *Eleventh Plastic Fuel Gas Pipe Symposium*, San Francisco, CA, 1989, p. 249.

³ Dickinson, A. and Ewing, L., *International Gas Research Conference*, Toronto, Canada, Vol 1, 1986, p. 52.

⁴ *Annual Book of ASTM Standards*, Vol 08.04.

⁵ *Annual Book of ASTM Standards*, Vol 08.01.

⁶ Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.