



Standard Test Method for Determination of Environmental Stress Crack Resistance (ESCR) of Polyethylene Pipe¹

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^{ε1} NOTE—Section 3.2.2 and Tables 1-3 were editorially revised in November 2002.

1. Scope

1.1 This test method covers the determination of a polyethylene pipe specimen's resistance to stress cracking when subjected to compression deformation in the presence of a surface active agent at elevated temperature.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses mathematical conversions to SI units, which are provided for information only and are not considered standard.

1.3 *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 1600 Terminology for Abbreviated Terms Relating to Plastics²

D 1693 Test Method for Environmental Stress Cracking of Ethylene Plastics³

F 412 Terminology Relating to Plastic Piping Systems⁴

3. Terminology

3.1 *Definitions*—Definitions of terms are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600, unless otherwise indicated.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *environmental stress crack resistance (ESCR)*—a number in units of hours-to-failure indicating the resistance of PE pipe to cracking at stresses below the short-term mechanical stress values of the pipe while immersed in a surface-active liquid at elevated temperature.

3.2.2 *failure, n*—a crack in the surface of the pipe specimen, visible with the unaided eye.

3.2.2.1 *Discussion*—Extension of the controlled notch is not a failure. Appearance of more than one crack in a specimen shall be classified as a single failure.

4. Summary of Test Method

4.1 A ring specimen of the polyethylene pipe, having a controlled imperfection at one location, is exposed at an elevated temperature to the action of a surface active agent while compressed to deformation between parallel plates. The elapsed time in hours to observation of a stress crack failure in the specimen is recorded.

5. Significance and Use

5.1 This test method may be used to determine the environmental stress-crack resistance properties of a polyethylene pipe specimen while under high stress in the presence of the surface-active agent, and at an elevated temperature.

6. Apparatus

6.1 *Specimen Holder*—The test-specimen holder shall consist of two parallel plates having a width at least 1.2 times the nominal outside diameter of the pipe. Fig. 1 shows suggested dimensions for a holder for 1¼-in. pipe. Construction shall be of corrosion-resistant metal such as Type 304 or 316 stainless steel. The plates shall have a series of appropriately spaced holes through which bolts or threaded rod can be inserted to effect compression of the test specimen by the use of nuts. It is required that spacers having a thickness equal to the distance required for compression be used to minimize the time to effect compression of the test specimen to ensure consistent and uniform compression and to prevent overcompression. The plates shall remain parallel throughout the testing period.

6.2 *Notching Jig*—The blade used shall be a single-edge stainless blade⁵ (Table 1). The blade shall be replaced after it has been used to produce 20 notches. Additionally, the blade

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

³ *Annual Book of ASTM Standards*, Vol 08.03.

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

⁵ A blade made by the American Safety Razor Co., Industrial Products Division, Razor Blade Lane, Verona, VA 24482, or equivalent, has been found satisfactory for this purpose.