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# Standard Test Method for Environmental Stress Crack Resistance (ESCR) of Plastic Tighthead Drums Not Exceeding 60 Gal (227 L) in Rated Capacity[1]

This standard is issued under the fixed designation D 5571; 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 provides an indication of the environmental stress crack resistance of plastic tighthead drums as a summation of the effects of container design, resin, manufacturing conditions, field performance, and other factors.

1.2 This test method may be used to evaluate a plastic drum's resistance to failure by cracking when in the presence of chemical and physical stresses.

1.3 Two procedures are provided as follows:

1.3.1 *Procedure A*—Internal pressure stress crack resistance method to nonyl phenoxypoly (ethyleneoxy) ethanol solution, a stress cracking reagent. The internal pressure is controlled at a constant elevated pressure and temperature.

1.3.2 *Procedure B*—Top-load stress crack resistance method to nonyl phenoxypoly ethanol, a stress cracking reagent. The compressive top load is controlled at a constant weight while maintaining an elevated temperature.

1.4 Although these procedures are not designed to test the ability of the closure or closure gasket material to retain the test reagent, the inclusion of closure failure as a container failure mode is optional. However, leakage through a closure may affect the internal pressure that could affect the test results.

1.5 This test method does not attempt to address all factors that could lead to stress cracking of plastic drums. The user of this standard may use other test parameters, such as top loads, chemical reagents, etc., as agreed upon between the user and supplier in the event of a drum qualification or purchase agreement.

1.6 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.7 *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.* Specific precautionary statements are given in Note 1.

## 2. Referenced Documents

2.1 *ASTM Standards:*

D 996 Terminology of Packaging and Distribution Environments[2]

D 4577 Test Method for Compression Resistance of a Container Under Constant Load[2]

E 122 Practice for Choice of Sample Size to Estimate the Average Quality of a Lot or Process[3]

## 3. Terminology

3.1 *Definitions*—Reference Terminology D 996 for definitions of terms applicable to this test method.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *environmental stress crack*—a crack that develops when a plastic drum is exposed to chemical and physical stresses.

3.2.2 *plastic tighthead drum*—A non-removable head plastic drum, maximum capacity not exceeding 60 gal (227 L), with openings for filling and emptying not exceeding 2.76 in. (70 mm) in diameter.

3.2.3 *stress crack failure*—any environmental stress crack that penetrates through the thickness of the drum resulting in a loss or leakage of the test reagent shall be interpreted as a failure.

## 4. Summary of Test Method

4.1 *Procedure A*—Exposes a minimum of three partly filled plastic drums to the action of a stress cracking reagent, within the container, at an elevated internal pressure and elevated temperature. The test duration shall be 14 days, or as specified by the user.

4.2 *Procedure B*—Exposes a minimum of three plastic drums to a mechanical top load at elevated temperatures. The drums are filled with a stress cracking reagent and sealed prior to the load being applied. The test duration shall be 14 days, or as specified by the user.

## 5. Significance and Use

5.1 These procedures provide an indication of the environmental stress-crack resistance of plastic tighthead drums. This

[1] This test method is under the jurisdiction of ASTM Committee D-10 on Packaging and is the direct responsibility of Subcommittee D10.23 on Natural Environment Test Methods.

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[2] *Annual Book of ASTM Standards*, Vol 15.09.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

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