



Standard Test Method for Environmental Stress-Crack Resistance of Blow-Molded Polyethylene Containers¹

This standard is issued under the fixed designation D2561; 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 Under certain conditions of stress, and in the presence of environments such as soaps, wetting agents, oils, or detergents, blow-molded polyethylene containers exhibit mechanical failure by cracking at stresses appreciably below those that would cause cracking in the absence of these environments.

1.2 This test method measures the environmental stress crack resistance of containers, which is the summation of the influence of container design, resin, blow-molding conditions, post treatment, or other factors that can affect this property. Three procedures are provided as follows:

1.2.1 *Procedure A, Stress-Crack Resistance of Containers to Commercial Liquids*—This procedure is particularly useful for determining the effect of container design on stress-crack resistance or the stress-crack resistance of a proposed commercial package containing a proprietary liquid product.

1.2.2 *Procedure B, Stress-Crack Resistance of a Specific Container to Polyoxyethylated Nonylphenol (CAS 68412-54-4), a Stress-Cracking Agent*—The conditions of test described in this procedure are designed for testing containers made from Class 3 polyethylene Specification D4976. Therefore, this procedure is recommended for containers made from Class 3 polyethylene only. This procedure is particularly useful for determining the effect of resin on the stress-crack resistance of the container.

1.2.3 *Procedure C, Controlled Elevated Pressure Stress-Crack Resistance of a Specific Container to Polyoxyethylated Nonylphenol (CAS 68412-54-4), a Stress-Cracking Agent*—The internal pressure is controlled at a constant elevated level.

NOTE 1—There are environmental concerns regarding the disposal of Polyoxyethylated Nonylphenol (Nonylphenoxy poly(ethyleneoxy) ethanol (CAS 68412-54-4), for example, Igepal CO-630). Users are advised to consult their supplier or local environmental office and follow the guidelines provided for the proper disposal of this chemical.

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.19 on Film, Sheeting, and Molded Products.

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1.3 These procedures are not designed to test the propensity for environmental stress cracking in the neck of containers, such as when the neck is subjected to a controlled strain by inserting a plug.

1.4 The values stated in SI units are to be regarded as standard.

NOTE 2—There is no known ISO equivalent to this 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.* Specific precautionary statements are given in Section 8 and **Note 2** and **Note 9**.

2. Referenced Documents

2.1 *ASTM Standards:*²

D618 Practice for Conditioning Plastics for Testing

D4976 Specification for Polyethylene Plastics Molding and Extrusion Materials

D5947 Test Methods for Physical Dimensions of Solid Plastics Specimens

E145 Specification for Gravity-Convection and Forced-Ventilation Ovens

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.2 *failure*—during this test method, the formation of any imperfection, such as a crack, which results in a loss of pressurizing gas or stress-cracking agent.

3.2.1 *Discussion*—A container has failed when:

It has lost pressure through any aperture other than heat seal areas; or, in Procedure C, when there is a detectable flow of supply air into the bottle, there is any visible crack completely through the container wall, there is evidence of the contained liquid on the outside of the container through

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.