



Designation: D1693 – 21

Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics¹

This standard is issued under the fixed designation D1693; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This test method covers the determination of the susceptibility of ethylene plastics, as defined in Terminology [D883](#), to environmental stress-cracking when subjected to the conditions herein specified. Under certain conditions of stress and in the presence of environments such as soaps, wetting agents, oils, or detergents, ethylene plastics may exhibit mechanical failure by cracking.

1.2 The values stated in SI units are to be regarded as 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no known ISO equivalent to this standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[D618 Practice for Conditioning Plastics for Testing](#)

[D883 Terminology Relating to Plastics](#)

[D1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature](#)

[D1248 Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable](#)

[D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials](#)

[D4703 Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets](#)

[D4976 Specification for Polyethylene Plastics Molding and Extrusion Materials](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

2.2 ASTM Adjuncts:

Apparatus Drawings and Blueprints³

3. Terminology

3.1 Definitions:

3.1.1 *stress-crack, n*—an external or internal rupture in a plastic caused by tensile stresses less than its short-time mechanical strength.

3.1.1.1 *Discussion*—The development of such cracks is frequently accelerated by the environment to which the plastic is exposed. The stresses which cause cracking may be present internally or externally, or may be a combination of these stresses. The appearance of a network of fine cracks is called crazing.

3.1.2 *stress-crack failure, n*—for purposes of this test method, any crack visible to an observer with normal eyesight shall be interpreted as a failure of the entire specimen **(1)**.⁴ Extension of the controlled imperfection shall not be construed as a failure. The appearance of more than one crack in a single specimen shall be construed as a single failure.

3.1.2.1 *Discussion*—Cracks generally develop at the controlled imperfection and run to the outer edge of the specimen approximately at right angles to it **(2)**. The cracks need not extend completely through the specimen to constitute failure. Cracks sometimes develop under the polymer surface, manifesting themselves as depressions on the surface. The time when this occurs should be noted, and if the depression later develops into a crack, the time of dimpling should be considered as the failure time.

¹ This test method is under the jurisdiction of ASTM Committee [D20](#) on Plastics and is the direct responsibility of Subcommittee [D20.15](#) on Thermoplastic Materials.

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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.

³ Detailed drawings of the apparatus are available from ASTM Headquarters. Request [ADJD169302](#), [ADJD169303](#), or [ADJD169304](#). For a complete set of all drawings, request [ADJD1693CS](#).

⁴ The boldface numbers in parentheses refer to the list of references at the end of this test method.

*A Summary of Changes section appears at the end of this standard