



Standard Test Method for Machine Direction Elastic Recovery and Permanent Deformation and Stress Retention of Stretch Wrap Film¹

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1. Scope

1.1 This test method covers the measurement of recovery from extension, permanent deformation, and stress retention of stretch wrap film.

1.2 Several levels of extension are included to ascertain the effect of both small and large extensions.

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

1.4 *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 882 Test Methods for Tensile Properties of Thin Plastic Sheeting²

D 1898 Practice for Sampling of Plastics²

D 996 Terminology of Packaging and Distribution Environments³

D 2103 Specification for Polyethylene Film and Sheeting²

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process⁴

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁴

3. Terminology

3.1 *Definitions:* General definitions for packaging and distribution environments are found in Terminology D 996.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *elastic recovery*—the percentage of a given deformation that behaves elastically, after 180 s when subjected to the extensions prescribed in this test method.

3.2.2 *permanent deformation*—the increase in length, expressed as a percentage of the original length, by which an

elastic material fails to return to original length after subjected to the extensions prescribed in the test procedure in this method.

3.2.3 *stress retention*—the percentage of stress retained 60 s or 24 h, or both, after application.

4. Summary of Test Method

4.1 Elastic properties of the films are determined by subjecting specimens to known extensions and by measuring the quantity of recovery and the permanent change with respect to the original dimensions.

5. Significance and Use

5.1 Elastic recovery is related to the ability of a package to resume its original shape after being distended during its use cycle.

5.2 Elastic recovery also relates to the tightness or snugness of a package.

5.3 Stress retention is related to the tightness or snugness of a package.

6. Apparatus

6.1 *Tensile Testing Machine*, with a reversible chart, complying with the requirements listed for Method A of Test Methods D 882 with grips satisfactory for the purpose. Refer to section on grips in Test Methods D 882.

6.2 *Specimen Cutter*, capable of producing nick-free 1 ± 0.001 in. (25.4 ± 0.03 mm) testing strips, with a precision of 1 ± 0.001 in. (25.4 ± 0.03 mm).⁵

6.3 *Micrometer*, capable of measuring the thickness of specimens to 0.001 in. (0.03 mm) as described in 8.9.1.1 of Specification D 2103.

7. Sampling

7.1 *Acceptance Sampling*—Sampling shall be in accordance with Practice D 1898.

7.2 *Sampling for Other Purposes*—The sampling and the number of test specimens depend on the purposes of the testing. Practice E 122 is recommended. Test specimens are taken from several rolls of film, and when possible, from several production runs of a product. Strong conclusions about a specific property of a film cannot be based on a single roll of product.

¹ This test method is under the jurisdiction of ASTM Committee D-10 on Packaging and is the direct responsibility of Subcommittee D10.25 on Palletizing and Unitizing of Loads.

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

³ *Annual Book of ASTM Standards*, Vol 15.09.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ A JDC-1-10 precision cutter is available from Thwing-Albert Instrument Co., 10960 Dutton Rd. Philadelphia, PA 19154, or similar manufacturers.