



Designation: D 5459 – 95 (Reapproved 2001)

## Standard Test Method for Machine Direction Elastic Recovery and Permanent Deformation and Stress Retention of Stretch Wrap Film<sup>1</sup>

This standard is issued under the fixed designation D 5459; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 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:*<sup>2</sup>

**D 882** Test Method for Tensile Properties of Thin Plastic Sheeting

**D 1898** Practice for Sampling of Plastics<sup>3</sup>

**D 996** Terminology of Packaging and Distribution Environments

**D 2103** Specification for Polyethylene Film and Sheeting

**E 122** Practice for Calculating Sample Size to Estimate, With a Specified Tolerable Error, the Average for a Characteristic of a Lot or Process

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

### 3. Terminology

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

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.25 on Palletizing and Unitizing of Loads.

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<sup>2</sup> 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.

<sup>3</sup> Withdrawn.

### 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  $1 \pm 0.001$  in. ( $25.4 \pm 0.03$  mm) testing strips, with a precision of  $1 \pm 0.001$  in. ( $25.4 \pm 0.03$  mm).<sup>4</sup>

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**.

<sup>4</sup> A JDC-1-10 precision cutter is available from Thwing-Albert Instrument Co., 10960 Dutton Rd. Philadelphia, PA 19154, or similar manufacturers.