



Designation: D 3939 – 97a

Standard Test Method for Snagging Resistance of Fabrics (Mace Test Method)¹

This standard is issued under the fixed designation D 3939; 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 determines the snagging resistance of a fabric.

1.2 Studies of fabric snagging have shown that this test method is suitable for a range of woven and knitted fabrics made from textured or untextured yarns containing staple or continuous filaments.^{2,3} This test method is not suitable for (1) open construction fabrics (such as a net) because the points on the mace will snag the felt pad rather than the specimen, (2) very heavy or very stiff fabrics than cannot be made to fit tightly on the drum and felt pad, and (3) tufted or nonwoven fabrics because the apparatus is designed for woven and knitted fabrics.

1.3 The values stated in either acceptable metric units or in other units shall be regarded separately as the standard. The values stated in each system may not be exact equivalents; therefore, each system must be used independently of the other, without combining values in any way. In case of referee decisions, the metric units will prevail.

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.* Specific precautionary statements are given in Section 7.

2. Referenced Documents

2.1 ASTM Standards:

- D 123 Terminology Relating to Textiles⁴
- D 1335 Test Method for Tuft Bind of Pile Floor Coverings⁴
- D 1776 Practice for Conditioning Textiles for Testing⁴
- D 2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics⁴
- D 3136 Terminology Relating to Permanent Labels for Consumer Textile and Leather Products and Other Textile Floor Coverings⁴

¹ This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.59 on Fabric Test Methods, General.

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² Finnigan, J. A., "Laboratory Prediction of the Tendency of a Fabric to Snag During Wear," *Textile Institute and Industry*, Vol 10, No. 6, 1972, pp. 164–167.

³ Leung, P., and Hershkowitz, R., "Snag- and Fuzz-Resistant Double Knits via Fabric Construction," *Textile Research Journal*, Vol 45, No. 2, 1975, pp. 93–102.

⁴ *Annual Book of ASTM Standards*, Vol 07.01.

D 4467 Practice for Interlaboratory Testing of a Test Method that Produces Non-Normally Distributed Data⁵

D 5362 Test Method for Snagging Resistance of Fabrics (Bean Bag Test Method)⁵

2.2 AATCC Standards:⁶

65 Snag Resistance of Women's Nylon Hosiery (see Note 1)

135 Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics

NOTE 1—In 1988, the AATCC voted to withdraw this method from its technical manual; however, the ASTM task group on fabric snagging decided it should be listed as an alternative for testing open construction fabrics.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *color contrast, n—in textiles*, a general term for a visible color difference between two adjacent areas.

3.1.1.1 *Discussion*—For the purpose of this test method, a color contrast is a visible color difference between a snag and the immediate surrounding area of the fabric that has no defects. Color contrasts often occur when printed fabrics are snagged.

3.1.2 *distortion, n—in fabrics*, a general term for a visible defect in the texture of a fabric.

3.1.2.1 *Discussion*—For the purpose of this test method, snags are composed of different combinations of protrusions and distortions. A distortion is characterized by a group of fibers, yarn, or a yarn segment that is displaced from its normal pattern so that there is a visible change in the texture of the fabric; however, the displaced group of fibers, yarn, or yarn segment does not extend above the fabric surface. Distortions include conditions where (1) tension on a snagged yarn has changed the size of some of the loops within a knitted fabric and the result is a pucker on the surface of the fabric, and (2) tension on a snagged yarn has caused the yarn to break off within a woven fabric and the result is a change in the texture where the yarn used to be.

3.1.3 *protrusion, n—in fabrics*, a general term for a visible group of fibers, a yarn, or a yarn segment that extends above the fabric surface.

3.1.4 *snag, n—in fabrics*, a yarn or part of a yarn pulled or plucked from the surface.

⁵ *Annual Book of ASTM Standards*, Vol 07.02.

⁶ Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

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3.1.4.1 *Discussion*—For the purpose of this test method, a snag is created when an object pulls, plucks, scratches, or drags a group of fibers, a yarn, or a yarn segment from its normal pattern. Snags can be classified into three types: (1) snags that have a protrusion and no distortion, (2) snags that have a distortion and no protrusion, and (3) snags that have both a protrusion and a distortion. Other changes in appearance, such as color contrasts, should be reported because they affect the visibility of a protrusion or a distortion.

3.1.5 *snagging resistance, n*—in textile fabrics, the property of a material whereby yarns or parts of yarns are prevented or inhibited from being pulled or plucked from the surface.

3.1.6 *Definitions*—For definitions of other textile terms used in this test method, refer to Terminology D 123.

4. Summary of Test Method

4.1 Fabric Specimens in tubular form are placed one at a time on a cylindrical drum. A mace (spiked ball) is allowed to bounce randomly against each rotating specimen. As the mace bounces over each specimen, snags could occur to a degree affected by a variety of fabric factors. The degree of fabric snagging is then evaluated by comparison of the tested specimens with visual standards that may be either fabrics or photographs of fabrics. The observed resistance to snagging is reported on a scale ranging from No. 5 (no snagging) to No. 1 (very severe snagging).

5. Significance and Use

5.1 This test method may be used to test the snagging resistance of most apparel and home furnishings fabrics. Modifications of this test method (see 5.1.1), or a different test method (see 5.1.2), may be needed for different types of fabrics and different end-uses (such as towels, pants, and upholstery).

5.1.1 For a specific fabric, if the test results from the mace test method do not correspond with the test results from a wear test, then (1) the procedure described in Section 12 or (2) the evaluation described in Section 13 can be modified. For

example, the number of revolutions (see 12.5) may be modified to provide meaningful test results. The purchaser and the supplier must agree to all changes in the procedure for operating the apparatus or for evaluating the test results.

5.1.2 Some fabrics that may not be suitable for this test method are described in 1.2. Many open construction fabrics can be tested for snagging resistance using AATCC Test Method 65. The snagging resistance of many pile floor coverings can be tested by Test Method D 1335.

5.2 Since fabric snagging can be affected by laundering or drycleaning, it may be advisable to test the snagging resistance of a fabric before and after laundering or drycleaning.

5.3 The snagging resistance of a specific fabric varies with individual wearers and general conditions of use. Therefore, it can be expected that garments of the same fabric will show a fairly wide snagging resistance spectrum after wear and much greater variation in wear than in replicate fabric specimens subjected to controlled laboratory tests. This factor should be considered when adopting levels of acceptability for any specification that includes snagging resistance.

5.4 Snags observed in worn garments vary appreciably in number and appearance. The appearance of a snag depends particularly on (1) the degree of color contrast between the snag and the surrounding area of the fabric or (2) the presence of long distortions or long protrusions. These conditions are not evaluated when snagging is rated solely on the number of snags. See Section 3 in this test method for a description of terminology such as color contrast, distortion, and protrusion; and see Figs. 1 through 3 in Test Method D 5362 for pictures of fabric defects due to snagging. Because the overall acceptability of a specific fabric is dependent on both the characteristics of the snags and other factors affecting fabric appearance, it is recommended that fabrics tested in the laboratory be evaluated with regard to the defects that may be observed visually and not rated solely on the number of snags developed. A series of visual rating standards (see 6.3.5) may be set up to provide a basis for the ratings. The visual rating standards are



FIG. 1 ABC Mace Tester

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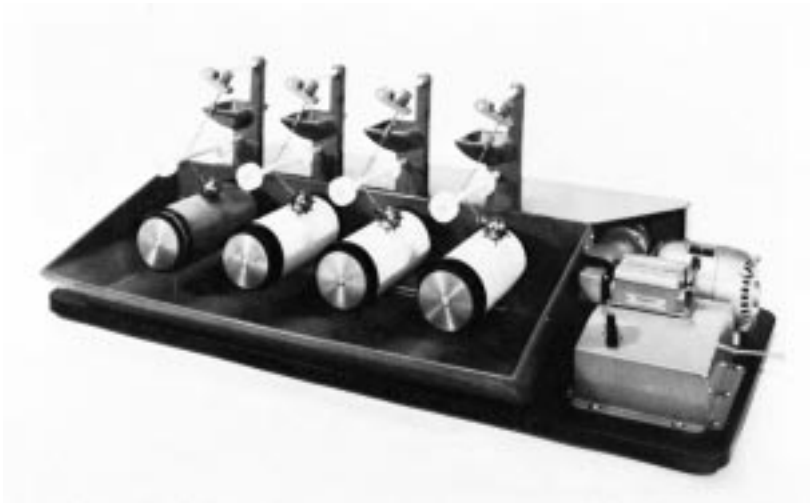
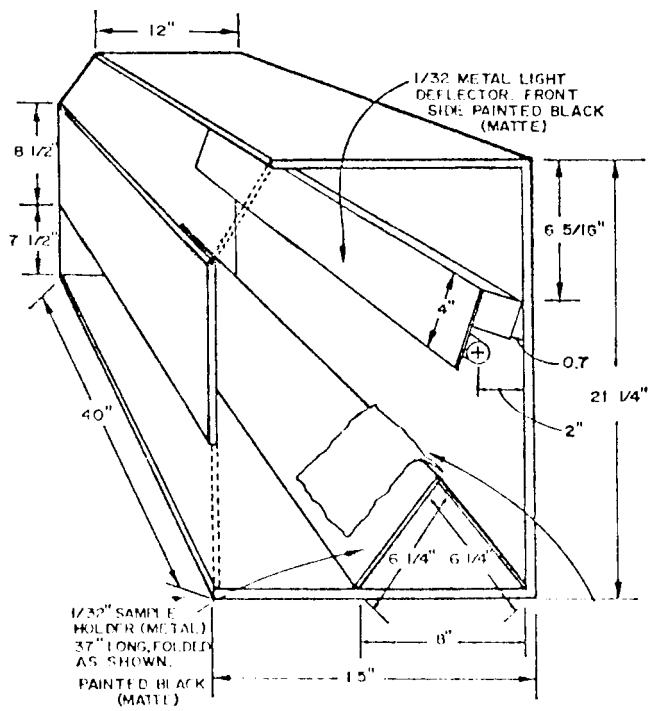


FIG. 2 ICI Mace Tester



Metric Equivalents			
in.	mm	in.	mm
1/32	1	8	203
0.7	18	8 1/2	215
2	50	12	305
4	100	15	380
6 1/4	159	21 1/4	540
6 5/16	160	37	940
7 1/2	190	40	1020

FIG. 3 Apparatus for Fabric Evaluation

most advantageous when the tested laboratory specimens correlate closely in appearance with fabrics from a wear test, for example, when tested laboratory specimens and fabrics from a wear test show similar color contrasts. In the preceding example, a series of fabrics from the wear test would be a good

choice for the fabric standards described in 6.3.5.2. 5.5 This test method is recommended for quality control testing of fabrics during manufacturing and product comparisons of different fabrics by manufacturers, retailers, and users. This test method may also be used by researchers to examine