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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Practice for Physical Characterization of Woven Paint Applicator Fabrics[1]

This standard is issued under the fixed designation D 6337; 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 practice covers the dimensions, terminology, and characteristics generally considered of importance to those dealing with woven paint applicator fabrics and describes methods for determining these parameters. This practice is not meant to be a definitive analytical method to deformulate woven fabrics.

1.2 The values stated in inch/pound units are to be regarded as the standard. The SI values given in parenthesis are provided for information only.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[2]

D 1776 Practice for Conditioning Textiles for Testing[2]

D 1777 Test Method for Measuring Thickness of Textile Materials[2]

D 3774 Test Method for Width of Woven Fabric[3]

D 3775 Test Method for Fabric Count of Woven Fabric[3]

D 3776 Test Methods for Mass Per Unit Area (Weight) of Fabric[3]

3. Terminology

3.1 *Definitions:* (see also Terminology D 123)

3.1.1 *backcoating*—a resin coating that is usually applied to the back of a fabric and heat cured to enhance its stability.

3.1.2 *backing*—a set of warp yarns or ends of defined composition that help create the base of a fabric that runs the length of the fabric (see Fig. 1).

3.1.3 *case of fabric*—a box of cloth, ready for shipping, usually consisting of slit reels.

3.1.4 *dyelot*—a specific quantity that is processed together and can be comparatively ranked within or among other dyelots.

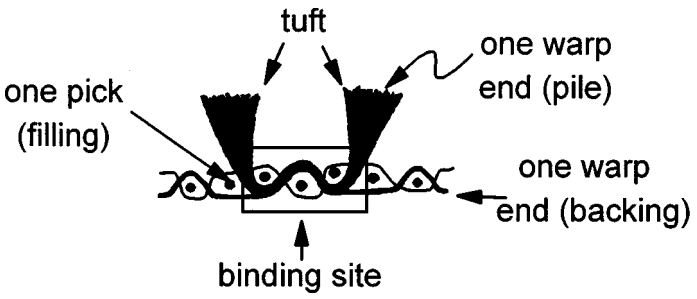

FIG. 1 Components of Typical Pile Fabric

3.1.5 *end*—one warp yarn (see Fig. 1).

3.1.6 *fiber*—an individual strand or filament of finite or continuous length that may be of a natural or synthetic origin.

3.1.7 *filling*—an individual yarn of defined composition that interlaces with warp ends at right angles in a woven fabric to help form the base of a pile fabric (see Fig. 1).

3.1.8 *laboratory sample*—a sample from each case of fabric for acceptance testing.

3.1.9 *lot sample*—a sample for acceptance testing consisting of a random number of dyelots as directed in agreement between purchaser and supplier.

3.1.10 *pick*—one filling yarn (see Fig. 1).

3.1.11 *pick glass*—an instrument with a magnifying lens and a set viewing field of one square inch used to identify construction (see Fig. 2).

3.1.12 *pile*—an additional set of warp yarns or ends of defined composition that are introduced into a pile fabric to make cut or uncut loops on the surface that are approximately perpendicular to the plane of the backing and filling (see Fig. 1).

3.1.13 *pile fabric*—a three-dimensional cloth with interlacing at right angles of three systems of yarn as warp, fill, and pile.

3.1.13.1 *Discussion*—Pile fabrics have a fur-like face that can consist of cut or uncut loops.

3.1.14 *pile fabric composition*—the total make-up of the fabric, being either natural or synthetic, or a combination.

3.1.15 *pile height micrometer*—a thickness testing instrument, referenced in Test Method D 1777.

3.1.15.1 *Discussion*—It consists of 4-in. (102-mm) diameter presser foot controlled by a lever, a gage with readings to

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[1] This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.61 on Paint Application Tools.

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[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] *Annual Book of ASTM Standards*, Vol 07.02.

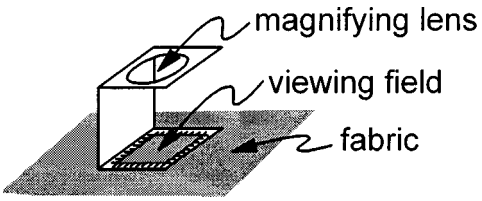

FIG. 2 Pick Glass

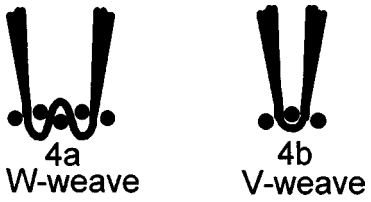

FIG. 4 Weave Constructions

the nearest 0.001 in. (0.025 mm) and a horseshoe-shaped handle that will measure 6 in. (152.4 mm) in to the body of the fabric (see Fig. 3).

3.1.16 *pile tuft density*—the quantity of pile per unit area as stated in pile tufts per square inch.

3.1.17 *reel*—a specified length of slit goods rolled together as one unit.

3.1.18 *shearable pile*—the pile tufts above the backing that can be removed with shear clippers.

3.1.19 *slitting*—a means of cutting the full width of fabric into longitudinal strips.

3.1.20 *slit width*—the width dimension of a fabric strip after slitting.

3.1.21 *test specimen*—a specimen cut from a reel of fabric.

3.1.21.1 *Discussion*—Each specimen shall be 6 in. (152.4 mm) in length, with one side of each specimen parallel to the warp ends.

3.1.22 *total fabric density*—fabric weight in ounces per square yard of finished fabric.

3.1.23 *tuft*—the entire loop that forms the face of the fabric and is attached to the backing fabric at a binding site (see Fig. 1).

3.1.24 *weave construction*—one repeat of a pattern, including per inch, ends per inch, and the way the pile weaves into the base of the cloth, for example, *W*-weave, *V*-weave.

3.1.24.1 *W-weave*—a weave construction where at least 3 picks are needed to form a tuft with the resulting tuft resembling the letter "*W*" (see Fig. 4 (*a*).

3.1.24.2 *V-weave*—a weave construction where only one pick is needed to form a tuft. The resulting tuft resembles the letter "*V*" (see Fig. 4) (*b*).

3.1.25 *woven fabric*—a cloth with interlacing at right angles of two systems of yarn known as warp and fill.

3.1.26 *yarn*—the coherent arrangement of fibers of varying or similar length, whose relative positions are maintained by a definite lateral twist to produce strength.

4. Significance and Use

4.1 It is important to recognize that all woven paint applicator fabrics are pile fabrics and can be a combination of several different yarns, in a range of densities, chemical compositions, and pile heights, which may influence painting performance.

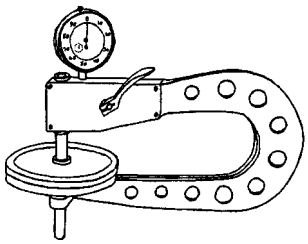

FIG. 3 Pile Height Micrometer

5. Apparatus

5.1 *Pile-Height Micrometer*[4]

5.2 *Graduated Linear Scale*, that measures to 1/32 in. increments (1 mm).

5.3 *Pick Glass*.

5.4 *Balance*, capable of weighing to 0.001 oz (0.10 g).

6. Determination of Physical Characteristics

6.1 *Total Fabric Height*—Determine the total fabric height by measuring the material thickness using a pile height micrometer (see Test Method D 1777). Report the dimensions to the nearest 0.001 in. (0.02 mm).

6.2 *Slit Width*—Determine the width by measuring the back of the cloth from warp end to warp end using a calibrated scale. Report dimensions to the nearest 1/32 in. (0.78 mm), with tolerances of ± 1/32 in. (±1 mm).

6.3 *Picks per Inch*—Determine picks per inch by counting individual filling yarns through a pick glass. Report to the nearest whole number with a tolerance of ± one pick.

6.4 *Total Fabric Density*—Determine the ounces per square yard using the balance (see Test Methods D 3776). Report fabric density to the nearest 0.001 oz/yd^2 (0.10 g/m^2).

6.5 *Pile Tuft Density*—The weave construction (*W*-weave or *V*-weave) must be known to determine the pile density. Report pile tuft density in tufts per square inch.

6.6 *Shearable Pile Density*—Determine the amount of pile that is above the backing. Report amount to the nearest 0.001 oz. (0.10 g).

6.7 *Pile Tuft Height*—Determine the pile tuft height by measuring the length of the tuft using a graduated linear scale. Report the length to the nearest 1/32 in. (1 mm).

7. Sampling

7.1 Tests shall be performed on the fabric as it will reach the purchaser.

7.2 Select the lot samples as specified for each test method. In the absence of such instructions in a specific test method, select lot sample as agreed upon between the purchaser and the supplier.

[4] The sole source of supply of the pile height micrometer known to the committee at this time is the Andrews Equipment Co., 4619 Torresdale Ave., Philadelphia, PA 19124. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

7.3 Systematically take a full reel from each side and from the center of each lot. Yardage from each reel in the laboratory sample will serve as test specimens.

7.4 Cut five test specimens from each reel in the laboratory sample.

8. Conditioning

8.1 Precondition and condition the laboratory samples as directed in Practice D 1776.

9. Procedure

9.1 *Total Fabric Height Measurement* (independent of, and does not correlate to, 9.7):

9.1.1 This procedure should only be used on fabrics with a slit width of 2 in. (51 mm) or more. On fabrics with a slit width of 4 in. (102 mm) or less, a correlation should be developed between the supplier and the purchaser.

9.1.2 Shake the specimen twice with a quirk jerk (like cracking a whip) to bloom the pile to its upright state. Handle the test specimens carefully to avoid altering the upright condition of the pile.

9.1.3 Place the specimen on the anvil of the micrometer and bring the presser foot into contact with the pile side of the material. Gradually increase the pressure until the entire weight of the presser foot is applied to the material. Five s to full load is suggested.

9.1.4 Read the thickness scale after a definite time interval that is clearly started in the test report. Select this interval to ensure that a reasonably stable condition exists at the time of making the observation. For most materials, 5 s after the full load has been applied will represent a stable condition and is a suitable time interval. Readings should be taken to the nearest 0.001 in (0.02 mm).

9.1.5 Repeat the measurements on the other specimens and report the average measurement, the maximum measurement, and the minimum measurement for all samples.

9.2 *Slit Width Measurement* (see Test Method D 3774):

9.2.1 Lay the test specimen, pile side down, on a smooth horizontal surface without tension in any direction and free of wrinkles or distortion. Use a graduated linear scale that is longer than the specimen is wide.

9.2.2 Measure the width of the fabric, which will be the distance from the outer edge of the outer warp end on one side to the outer edge of the outer warp end on the other side, measured perpendicular to the warp ends. Measurements should be taken at two points separated by at least 3 in. (76 mm) along the length of the fabric. Do not take measurements closer than 1 in. (25 mm) to the cut ends of the specimen.

9.2.3 Repeat the measurements on all specimens and report the average measurement, the maximum measurement, and the minimum measurement for all samples.

9.3 *Picks per Inch Measurement* (see Test Method D 3775):

9.3.1 Lay the test specimen, pile side down, on a smooth horizontal surface without tension in any direction and free of wrinkles or distortion. Lay the pick glass on the fabric and line the top of the viewing field so that it is parallel to the filling. Count the filling yarns (picks) along the side of the glass in the 1-in. (25-mm) space. Counting should be done at two separate areas of the specimen. Do not count measurements closer than 1 in. (25 mm) to the cut ends of the specimen.

9.3.2 *Optional Count Procedure*—For fabric designs where individual yarns (picks) cannot be readily distinguished for counting in fabric, there are two optional ways to count the picks. Either option may be selected.

9.3.2.1 Ravel a piece of fabric perpendicular to the direction to be counted by removing picks from the fabric to get a straight edge. Mark at least 1 in. (25 mm) along the length of the specimen, then ravel and count the picks to the mark. Obtain the count in at least two places along the length of the specimen.

NOTE 1—This method destroys the specimen!

9.3.2.2 The other method is to ravel the fabric parallel to the direction to be counted. This can be done by removing a few backing ends from the fabric edge. Lay the pick glass on the raveled edge of the fabric so that the top of the viewing field is parallel to the filling yarns. Count the number of picks protruding from the edge of the fabric as seen in the 1-in. (25-mm) length of the viewing field.

9.3.2.3 *Calculation*—All measurements from the above methods should be converted to picks per inch as can be read from a pick glass. If more than 1 in. (25 mm) is counted, the total number of picks must be divided by the length counted in inches.

9.3.3 Repeat the procedure on the other specimens and record the average measurement, the maximum measurement, and the minimum measurement.

9.4 *Total Fabric Density*:

9.4.1 Measure the mass per unit area of the specimen in accordance with Practice D 3776.

9.4.2 The mass per unit are (or total fabric density) should be calculated in oz/yd^2 (g/m^2).

9.4.3 Repeat the procedure on the other specimens and record the average measurement, the maximum measurement, and the minimum measurement.

9.5 *Pile Tuft Density*:

9.5.1 The pile density is measured in pile tufts per unit area, that is: pile tufts per square inch.

9.5.2 In order to determine the pile density, the following items must be known. These items may be found on or calculated from the specification data.

9.5.2.1 *Pile Rows Per Inch*—To find the number of pile rows per inch, divide the total number of pile rows by the finished cloth width in inches. The total number of pile rows may or may not be equivalent to the total number of pile ends.

9.5.2.2 *Picks Per Inch*—This may be found as described in 9.3 of this practice or on the specification.

9.5.2.3 *Picks Per Tuft*—Determined by visually examining the weave construction of the fabric. To determine picks per tuft, count the number of picks between identical points on two successive pile tufts in a pile row (see Fig. 5).

9.5.3 *Calculating Pile Density*:

$$\text{Pile density (tufts / inch}^2\text{)} = [(\text{picks/inch}) / (\text{picks/tuft})] \times \text{pile rows/inch} \quad (1)$$

9.6 *Shearable Pile Density (oz./yd^2 (g/m^2))*:

9.6.1 Cut a rectangular piece of fabric, at least 4 by 4 in.

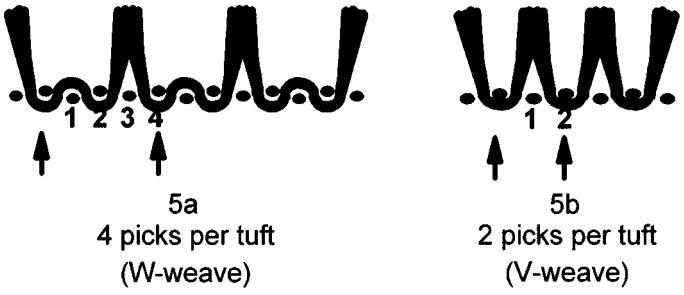

FIG. 5 Examples of Picks per Tuft

(102 by 102 mm), or dimensions decided upon between the purchaser and the supplier.

9.6.2 Calculate and record the area of the fabric in square inches.

9.6.3 Weigh the sample and record the weight in grams.

9.6.4 Using shear clippers[5] with a No. 50 - size 000 blade, shear pile as close to the backing as possible.

9.6.5 Weight the remaining sheared backing and record the weight in grams.

9.6.6 Calculate the shearable pile density in ounces per square yard of fabric according the following equation:

$$\text{Shearable pile density (oz./yd}^2\text{)} = 4.57 \times (A - B) / C \qquad (2)$$

where:

A = weight of original sample (grams),
B = weight of sheared sample (grams),
C = area of sample (square inches).

[5] The sole source of supply of the shear clippers known to the committee at this is time is Oster Professional Products, Route 9, Box 541 Cadillac Lane, McMinnville, TN 37110. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

NOTE 2—45.7 is the conversion factor for converting grams/in^2 to oz./yd^2.

9.6.7 Repeat the procedure on the other specimens and record the average measurement, the maximum measurement, and the minimum measurement.

9.7 *Pile Tuft Height*:

9.7.1 Shake the specimen twice with a quick jerk (like cracking a whip) to bloom the pile to its upright state. Handle the test specimens carefully to avoid altering the upright condition of the pile.

9.7.2 Lay the test specimen, pile side up, on a smooth horizontal surface without tension in any direction and free of wrinkles or distortion. Use a graduated linear scale that is longer than the pile height.

9.7.3 Place a graduated linear scale behind a tuft along the warp line (perpendicular to the filling). Measurements should be taken in the center of the test specimen (see Fig. 6).

9.7.4 Read the tuft length to the nearest 1/32 in. (1 mm).

9.7.5 Repeat the measurements on the other specimens and report the average measurement, the maximum measurement, and the minimum measurement for all samples.

10. Keywords

10.1 physical characterization; woven paint applicator fabrics

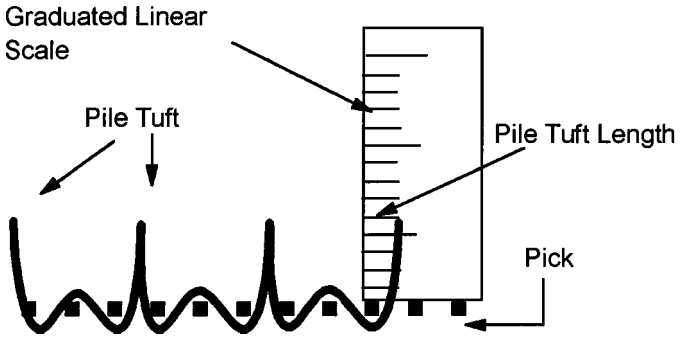

FIG. 6 Measuring Pile Tuft Length