Designation: D 6702 – 01

Standard Test Method for Determining the Dynamic Wiping Efficiency of Nonwoven Fabrics Not Used in Cleanrooms[1]

This standard is issued under the fixed designation D 6702; 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 covers the quantifying of the dynamic wiping efficiency of nonwoven fabrics.

1.2 This test method applies to all nonwoven fabrics not used in cleanrooms.

NOTE 1—For dynamic wiping efficiency in cleanrooms, refer to Test Method D 6650 Standard Test Method for Determining the Dynamic Wiping Efficiency, Wet Particle Removal Ability, and Fabric Particle Contribution of Nonwoven Fabrics Used in Cleanrooms.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as the standard. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

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 [2,3]

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[4]

D 6650 Test Method for Determining the Dynamic Wiping Efficiency, Wet Particle Removal Ability, and Fabric Particle Contribution of Nonwoven Fabrics Used in Cleanrooms[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *cleanroom*, *n*—a room in which the concentration of airborne particles is controlled, and which is constructed and used in a manner to minimize the introduction, generation, and retention of particles inside the room.

3.1.1.1 *Discussion*—In addition to particles, other relevant parameters, such as temperature, humidity, and pressure, are controlled as required. The so-called Class of a cleanroom is defined in documents including, but not limited to, Federal Standard 209E as the concentration per unit volume of particles of a designated size. The various systems for such classification lie beyond the scope of this document.

3.1.2 *dynamic wiping efficiency*, *n*—in textile fabrics, the ability of a fabric to remove water, or other liquids, from a surface, usually for spill removal.

3.1.2.1 *Discussion*—The ability of a fabric to hold liquid is largely a function of the composition and consturction of the fabric. A naturally sorptive fabric made of or with hydrophilic components will ABSORB liquid (typically water), while those made of hydrophobic materials will ADSORB liquid (typically water) between the interstices of the fibers composing the fabric. In many cases, both absorption and adsorption take place.

3.2 For definitions of terms used in this test method refer to Terminology D 123.

4. Summary of Test Method

4.1 A quarter-folded fabric swatch is clipped to the underside of a 1-kg sled and pulled through a known challenge of liquid, usually water, placed on a flat surface directly in front of a wiper fabric and sled. The percent of liquid removed from the surface is determined gravimetrically as the dynamic wiping efficiency.

5. Significance and Use

5.1 This test method can be used for acceptance testing of commercial shipments but comparisons should be made with caution because information on estimates of between-laboratory precision is limited as noted in the precision and bias section of this test method.

5.1.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them, using competent statistical

[1] This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.90 on Executive.

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[2] Oathout, J. M., "Determining the Dynamic Efficiency of Cleanroom Wipers for Removal of Liquids and Particles from Surfaces," *Journal of the IEST*, 62 (3), 17–26, May/June 1999.

[3] "Evaluating Wiping Materials Used in Cleanrooms and Other Controlled Environments," IEST-RP-CC004.2, Institute of Environmental Science and Technology, 940 East Northeast Highway, Mount Prospect, IL 60056 (1992).

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

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

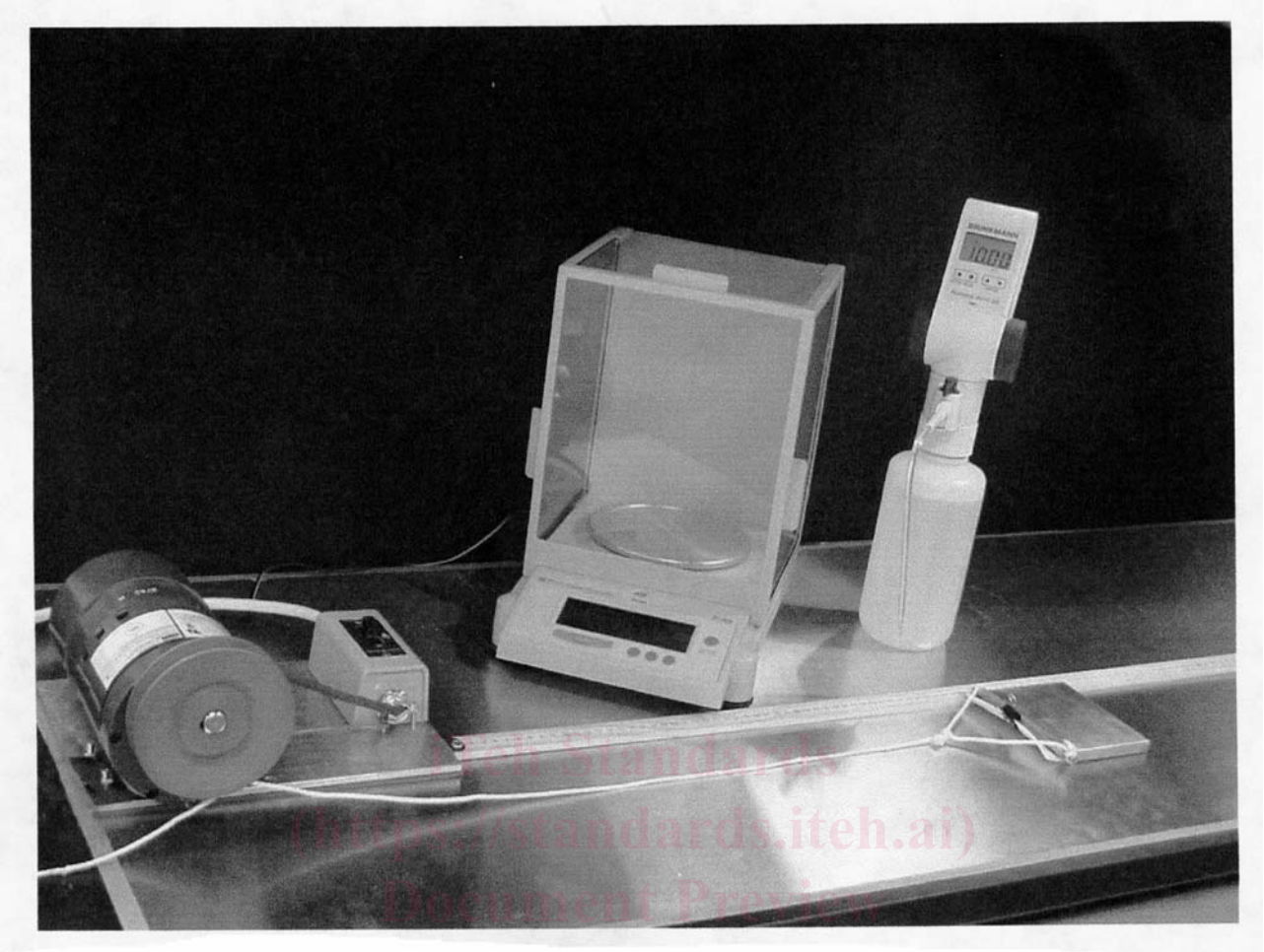


FIG. 1 Illustration of Dynamic Wiping Efficiency Apparatus

assistance. As a minimum, samples used for such comparative tests should be as homogeneous as possible, drawn from the same lot of material as the samples that resulted in disparate results during initial testing, and randomly assigned in equal numbers to each laboratory. Other fabrics with established test values may also be used for these comparative tests. The test results from the laboratories involved should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If bias is found, either its cause must be found and corrected, or future test results must be adjusted in consideration of the known bias.

5.2 This test method depends on the ability to accurately place a known mass/volume of liquid on the surface, so that an accurate mass of liquid adsorbed may be determined.

5.3 This test method is useful to select fabrics with superior cleaning and drying properties that can minimize the costs for spill removal. It can also be used to research fabrics for improved spill removal and for production control.

6. Apparatus and Materials

6.1 *Dynamic Wiping Efficiency Test Apparatus*, consisting of a polyester string attached to two stainless steel screws on a stainless steel sled (6.1.1), forming a yoke, and with a second polyester string, approximately 1.5-m (5 ft) long having one end of attached at the midpoint of the yoke and the other end attached to a motor (6.1.2) that provides a sled pull rate of 25 cm/s (10 in./s). (See Fig. 1).

6.1.1 *Sled*, # 304 stainless steel, 1 kg ± 10g, 117 × 117 mm base, 9.53 mm thick (4.63 by 4.63 in. base, 0.375 in. thick); a curved leading edge, 13 mm (0.50 in.) radius, on the base of the sled forms a lip to which the quarter-folded sample is attached using a spring-loaded clip. Two stainless steel screws are affixed to either outboard edge of the sled in the leading curved edge. (See Fig. 2).

6.1.2 *Motor*, 60 Hz. equipped with a 25 cm (9.84 in.) circumference sheave used as a capstan device to pull the sled at a constant and uniform speed of 25 cm/s (10 in./s).

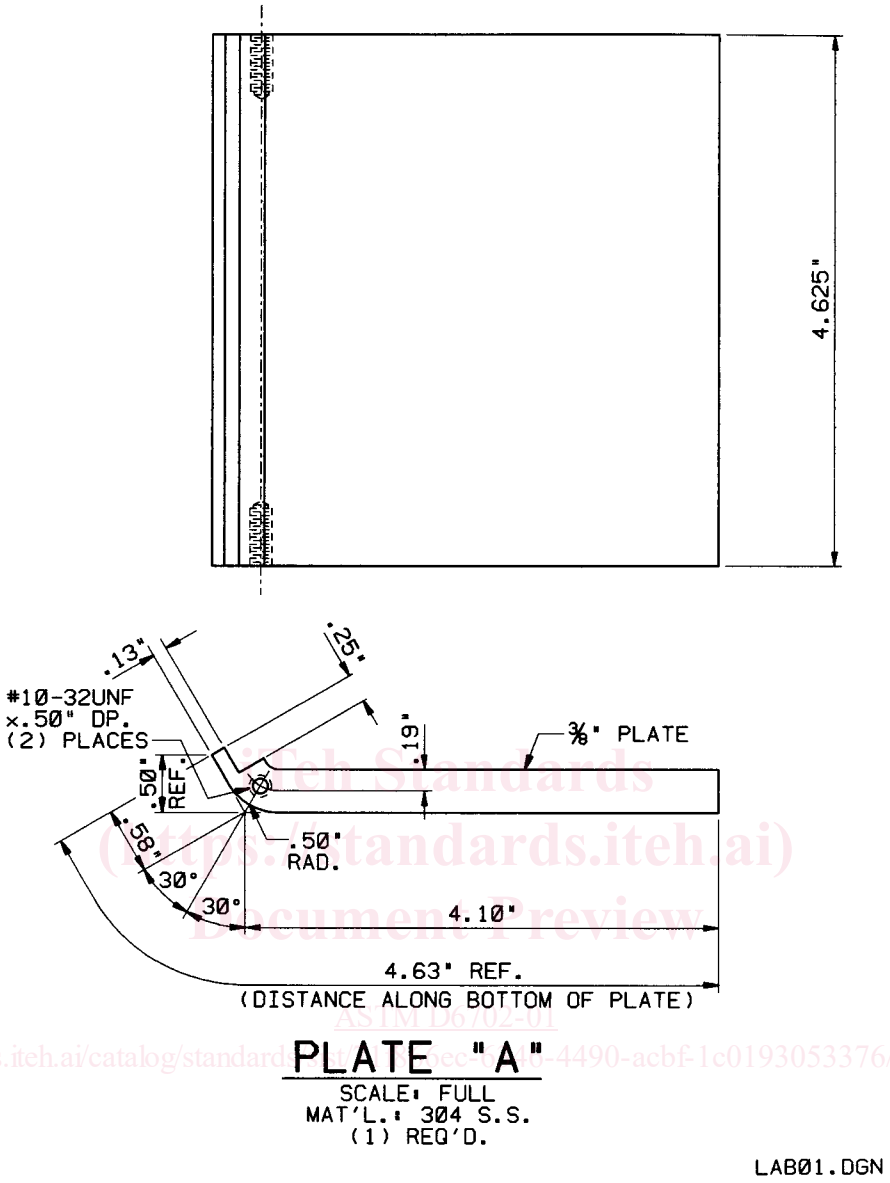
6.2 *Balance*, top loading, shielded, 0.01 g readability.

6.3 *Metal Plate*, No. 304, 18 gauge stainless steel, Polish #3 (Brush finish), 61 cm (2 ft) × 122 cm (4 ft).

6.4 *Dispenser*, digital bottletop burette, for reproducible and accurate delivery of liquid volumes, Brinkmann Bottletop Buret, Model 25, or equivalent.

6.5 *Liquid*, usually water at least distilled grade, or other liquid when specified.

6.6 *Tray*, or other container, suitable for wetting out a 229 mm (9.00 in.) square specimen to determine intrinsic soptive capacity (See Annex A1).



NOTE—For SI units in millimeters, multiply inches by 25.4.

FIG. 2 Drawing of Sled

7. Sampling and Test Specimens

7.1 *Primary Sampling Unit*—Consider rolls, bolts, or pre-packaged pieces of textile fabric to be the primary sampling unit, as applicable.

7.2 *Laboratory Sampling Unit*—As a laboratory sampling unit, take from the primary sampling unit at least a one full-width piece of fabric that is 1 m (1 yd) in length along the machine direction, after removing a first 1 m (1 yd) length.

7.2.1 For primary sampling units having narrow widths or short lengths, use a sufficient number of pieces to prepare eight test specimens to the size described in 7.3.

7.3 *Test Specimen Size*—From each laboratory sampling unit, cut eight square test specimens 229 by 229 mm (9.00 by 9.00 in.); four specimens for the 10 mL challenge test and four specimens for the 50 % capacity challenge test. Specimen preparation need not be carried out in the standard atmosphere for testing. Label to maintain specimen identity.

7.3.1 Primary sampling units may consist of pre-packaged wiping material that are nominally 229 by 229 mm (9.00 by 9.00 in.) material squares. In those cases, use the entire square, quarter-folded, as the test specimen.

7.4 *Test Specimen Selection*—Select test specimens as follows:

7.4.1 Cut specimens representing a broad distribution diagonally across the width of the laboratory sampling unit.

7.4.2 Take no specimens closer than 25 mm (1.0 in.) from the machine direction edge, except as noted in 7.3.1.

7.4.3 Ensure specimens are free of folds, creases, or wrinkles. Avoid getting oil, grease, etc. on the specimens when handling.