Designation: D 4912 – 02

Standard Test Method for Fabric Stability of Vinyl-Coated Glass Yarn Insect Screening and Louver Cloth[1]

This standard is issued under the fixed designation D 4912; 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 provides a procedure for evaluating fabric stability by measuring the resistance to yarn slippage of filling yarns over warp yarns, or warp yarns over filling yarns in vinyl-coated glass yarn insect screening and louver cloth.

1.2 This test method shows the values in both SI units and inch-pound units. "SI units" is the technically correct name for a system of metric units known as the International System of Units. "Inch-pound units" is the technically correct name for the customary units used in the United States. The values expressed in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with this standard.

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 76 Specification for Tensile Testing Machines for Textiles[2]

D 123 Terminology Relating to Textiles[2]

D 4028 Specification for Solar Screening Woven from Vinyl-Coated Fiber Glass Yarn[3]

E 171 Specification for Standard Atmospheres for Conditioning and Testing Materials[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *atmosphere for testing textiles, n—for glass,* air maintained at a relative humidity of at least 48 % and no greater than 67 %, and at a temperature of at least 20°C (68°F) and no greater than 25°C (77°F).

3.1.1.1 *Discussion*—Glass textiles are used in various products such as reinforced plastics, mat-like material, tire cords, electrical insulation, etc. Each of these materials requires different testing atmospheres. It is the intent of the wide spread in testing atmosphere to allow testing of glass textiles in respective laboratories where end-product test atmosphere requirements differ. The test atmospheres for respective products should be controlled as specified in Specification E 171. It is the opinion of ASTM Subcommittee D13.18 that fabric stability of insect screening and louver cloth would not be affected by the range selected. In any event, the test atmosphere should be stated in the report.

3.1.2 *fabric stability, n—in vinyl coated glass screening and louver cloth,* the property denoting the ability to resist slippage of yarn segments in one direction over yarn segments in the opposite direction.

3.1.3 For definitions of other textile terms used in this test method, refer to Terminology D 123.

4. Summary of Test Method

4.1 Samples of the vinyl-coated glass yarn insect screening or louver cloth are subjected to a breaking force test where yarns have been severed within the gage length area. The force required to break the fused bond between yarn components and slip yarn segments in one direction over yarn segments in the opposite direction is reported as the *fabric stability.*

5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing of commerical shipments since the method has been used extensively in the trade for acceptance testing.

5.1.1 In cases of a dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens which are as homogeneous as possible and which are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two

[1] This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.18 on Glass Fiber and Its Products.

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

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

[4] *Annual Book of ASTM Standards,* Vol 08.03.

laboratories should be compared using Student's *t*-test for unpaired data and an acceptable probability level chosen by the two parties before the testing begins. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results in the light of the known bias.

5.2 Vinyl-coated glass yarn insect screening and louver cloth are subjected to a heating process to fuse the warp yarns to the filling yarns of the woven structure. The force at which yarns in one direction move over yarns in the opposite direction is a measure of the bond of fusion. The degree of the bond of fusion on the vinyl-coated glass yarn insect screening and louver cloth is used for process control. Fabric stability was formerly called resistance to yarn slippage.

6. Apparatus

6.1 *Tensile Testing Machine*—In case of dispute a constant-rate-of-extension, CRE, tensile testing machine as described in Specification D 76 will be used. When agreed upon between the purchaser and the supplier, a constant-rate-of-traverse tensile, CRT, testing machine can be used.

6.1.1 The clamp faces shall be rubber or smooth metallic faced at least 10 mm (0.4 in.) wider than the specimen width and with a minimum of 25 mm (1 in.) in the direction of application of force.

NOTE 1—The covering of the metallic faces with approximately a 3-mm (0.11-in.) thick cardboard or other suitable material has been found useful for preventing crushing of the specimen.

7. Sampling and Number of Specimens

7.1 *Lot Size*—A lot is defined as a single shipment of a single type of glass textile. A lot may constitute all or part of a single customer order.

7.2 *Lot Sample*—As a lot sample for acceptance testing, take the number of rolls of insect screening or louver cloth directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider rolls of insect screening or louver cloth to be the primary sampling unit. In the absence of such an agreement, take the number of rolls specified in Table 1.

TABLE 1 Number of Rolls of Fabric in the Lot Sample

Total Length of Fabric in Lot		Number of Lot Sampling Units
m	ft	
245 or less	800 or less	2
246 to 6700, inclusive	801 to 22 000, inclusive	3
6701 and over	22 001 and over	5

NOTE 2—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between rolls of insect screening or louver cloth and between test specimens from a swatch or roll of insect screening or louver cloth to produce a sampling plan with meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

7.3 *Laboratory Sample*—As a laboratory sample for acceptance testing, proceed as directed in an applicable material specification or other agreement between the purchaser and the supplier. In the absence of such an agreement, use the lot sampling units for the laboratory sampling units. Take a full width swatch, 2 m (2 yd) long, from each selected lot sampling unit of screening or louver cloth. Take swatches after first discarding a minimum of 1 m (1 yd) from the very outside of the roll.

7.4 *Test Specimens*—From each swatch in the laboratory sample, cut five specimens in each the warp and filling direction, 50 by 125 mm (2 by 5 in.) with the long dimension respectively parallel to the warp and filling yarns. Cut alternate lengthwise yarns as shown in Fig. 1. Cut yarns equidistant from the center of the specimen length having three widthwise yarns between the yarns cut above the center of the specimen length (Cut A) and the yarns cut below the center of the specimen length (cut B). Ensure each lengthwise yarn has only one cut. The short direction is the direction of test. Take test specimens from each swatch in the laboratory sample in such a way that no specimen is closer than one tenth the width of the swatch from the selvage with no two specimens cut parallel to the warp containing the same set of warp ends or if cut parallel to the filling, containing the same set of filling picks, and the specimens from different swatches are each taken from a different part of the width of the swatches.

8. Procedure

8.1 Condition the laboratory samples without preconditioning for period of at least 5 h in the atmosphere for testing glass textiles, unless otherwise specified.

NOTE 3—In any event, 24 h is considered ample exposure to bring the samples to moisture equilibrium.

8.2 Select the force range of the tensile testing machine such that the maximum force required to separate the specimen occurs between 10 and 90 % of the full-scale force range. Secure the specimen centrally in the clamps of the tensile

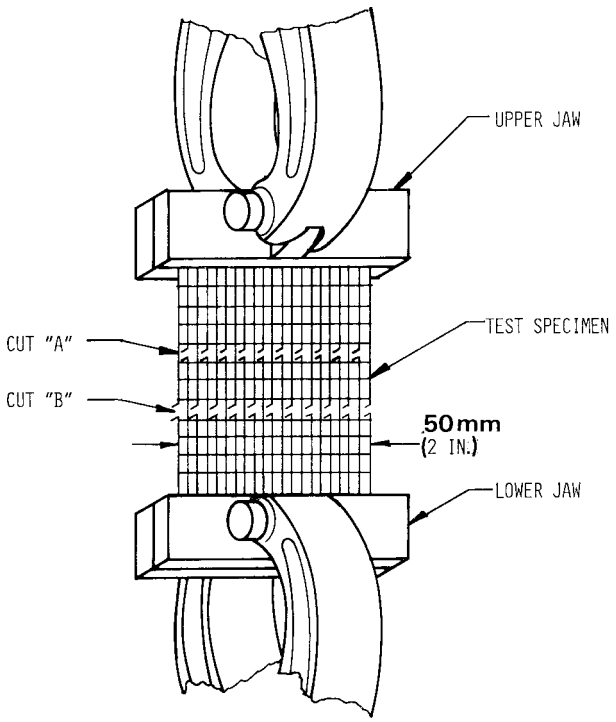

FIG. 1 Screening, Nonmetallic, Insert; Cut Pattern of Specimen

testing machine, taking care that the long dimension is as nearly as possible parallel to the direction of application of the force. Ensure that the tension in the specimen is uniform across the clamped width.

8.3 When using air-actuated clamps set the air pressure to 275 ± 15 kPa (40 ± 2 psi). When using manual clamps, ensure no slippage of the specimen occurs in the clamps.

8.4 Adjust the tensile testing machine in the starting position to a distance of 75 ± 1 mm (3 ± 0.05 in.) from nip to nip of the clamps along the specimen axis.

8.5 Operate the CRE tensile testing machine with a pulling speed of 125 ± 5 mm/min (5 ± 0.2 in./min), and when agreed upon between the purchaser and the supplier, a CRT tensile machine with a pulling speed of 300 ± 10 mm/min (12 ± 0.5 in./min).

NOTE 4—Values for fabric stability show no statistical difference at 95 % confidence limit when using the tensile testers and rates of operation specified in 8.4. Refer to Specification D 4028 for comparison.

8.6 Activate the tensile testing machine and record the maximum force required to separate the specimen into two sections as indicated by slippage of the yarns out of the woven pattern or out of the vinyl casing at the location between the cut lines. If a specimen slips in the jaws, breaks at the edge of, or in the jaws, or if for any reason attributed to faulty operation the result falls markedly below the average for the set of specimen, discard the result and take another specimen. Continue this procedure until the required number of acceptable specimens have been tested for each, the warp and filling direction.

9. Report

9.1 Report that the specimens were tested as directed in Test Method D 4912. Include the product description and the type tensile testing machine used.

9.2 Report, for each laboratory sampling unit of insect screening or louver cloth, the average newtons (pounds-force) for each, the warp, and filling direction.

9.3 Report, for the lot average, the average newtons (pounds-force) for each, the warp, and filling direction for all tested laboratory sampling units.

TABLE 2 Coefficients of Variation, Vinyl Coated Glass Yarn Insect Screening, Percent of Average

Material Direction	Single-Operator Component, %	Within-Laboratory Component, %	Between-Laboratory Component, %
Warp			
Single-material	7.8	4.1	0.0
Multi-material	9.8	4.1	6.0
Fill			
Single-material	7.1	5.0	2.8
Multi-material	7.1	5.0	5.1

10. Precision and Bias

10.1 *Summary*—In 95 out of 100 cases when comparing two averages of five determinations each, the differences should not exceed the following amounts when all of the determinations are taken by the same well trained operator using the same piece of test equipment and specimens randomly drawn from the same sample of material but tested at different times.

Warp Direction—9.6 % of the average
Fill Direction—8.8 % of the average

Larger differences are likely to occur under all other conditions. This test method has no bias since the true value of fabric stability can only be defined in a specific test method. The basis for this summary and for evaluations made under other conditions is explained in 10.2-10.4.

10.2 *Interlaboratory Test Data*[5]—An interlaboratory test was run in 1986 in which randomly drawn specimens of vinyl-coated glass yarn insect screening were tested in each of four laboratories. Each laboratory used two operators, each of whom tested five specimens of each material in each the warp and filling direction at different times. The components of variance expressed as coefficients of variation are listed in Table 2.

NOTE 5—The square roots of the components of variance are being reported to express the variability as a percent of the average fabric stability rather than as the square of that unit of measure.

10.3 *Precision*—For the components of variance reported in Table 2, two averages of observed values should be considered significantly different at the 95 % probability level if the difference equals or exceeds the critical differences listed in Table 3.

TABLE 3 Critical Differences for the Conditions Noted, Vinyl-Coated Glass Yarn Insect Screening, 95 % Probability Level, Percent of Average[A]

Number of Observations in Each Average	Single-Operator Precision, %	Within-Laboratory Precision, %	Between-Laboratory Precision, %
Warp, Single-Material Comparisons			
1	21.6	24.3	24.3
2	15.3	18.9	18.9
5	9.6	14.8	14.8
10	6.8	13.1	13.1
Warp, Multi-Material Comparisons			
1	22.3	25.0	30.0
2	16.2	19.8	25.8
5	11.1	15.8	22.9
10	8.8	14.3	21.9
Fill, Single-Material Comparisons			
1	19.7	24.0	25.3
2	13.9	19.6	21.1
5	8.8	16.3	18.1
10	6.2	15.1	17.0
Fill, Multi-Material Comparisons			
1	19.7	24.0	27.8
2	13.9	19.6	24.1
5	8.8	16.3	21.5
10	6.2	15.1	20.6

[A] To convert the values of the critical differences to fabric stability, pounds, multiply the critical difference by the average of the two specific sets of data being compared and then divide by 100.

NOTE 6—Since the interlaboratory test included only four laboratories, estimates of between-laboratory precision should be used with special caution.

[5] ASTM Research Report No. D-13-1077. A copy is available from ASTM Headquarters.

NOTE 7—The tabulated values of the critical differences should be considered to be a general statement particularly with respect to between-laboratory precision. Before a meaningful statement can be made about any two specific laboratories, the amount of statistical bias if any, between them must be established, with each comparison based on recent data obtained on specimens taken from a lot of material of the type being evaluated and nearly homogeneous as possible and then randomly assigned in equal numbers to the two laboratories.

10.4 *Bias*—The procedure in this test method has no bias because the value of fabric stability can be defined only in terms of a test method.

11. Keywords

11.1 fabric stability; vinyl-coated glass; insect screening; louver cloth