



Designation: D3656/D3656M – 13 (Reapproved 2021)

Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns¹

This standard is issued under the fixed designation D3656/D3656M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers the requirements for vinyl-coated glass yarn insect screening and louver cloth.

1.2 This specification is intended to assist ultimate users by designating the sizes and types of these products that are generally available in the industry.

1.3 This specification shows the terminology and requirements for:

1.3.1 Commercial standard vinyl-coated glass yarn insect screening designed and woven primarily for installation in or on any dwelling, patio, screening enclosure, building, or structure for the purpose of keeping out flies, mosquitoes, and most insects.

1.3.2 Vinyl-coated glass yarn louver cloth used extensively in soffit and louver vents to keep out most large insects, birds, and airborne litter, while at the same time providing for adequate ventilation and air circulation.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.5 The following precautionary caveat pertains only to the test methods portions, Sections 8 – 19, of this specification. *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*²

D123 Terminology Relating to Textiles

D1776/D1776M Practice for Conditioning and Testing Textiles

D3374/D3374M Specification for Vinyl-Coated Glass Yarns

D3773/D3773M Test Methods for Length of Woven Fabric

D3774 Test Method for Width of Textile Fabric

D3775 Test Method for End (Warp) and Pick (Filling) Count of Woven Fabrics

D3776/D3776M Test Methods for Mass Per Unit Area (Weight) of Fabric

D3786/D3786M Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method

D4028/D4028M Specification for Solar Screening Woven from Vinyl-Coated Fiber Glass Yarn

D4372 Specification for Flame-Resistant Materials Used in Camping Tentage (Withdrawn 2002)³

D4912/D4912M Test Method for Fabric Stability of Vinyl-Coated Glass Yarn Insect Screening and Louver Cloth

D4929 Test Method for Determination of Organic Chloride Content in Crude Oil

D7018/D7018M Terminology Relating to Glass Fiber and Its Products (Withdrawn 2021)³

2.2 *AATCC Standard:*⁴

Evaluation Procedure 1, Gray Scale for Color Change

² 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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709-2215, <http://www.aatcc.org>.

¹ This specification 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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TABLE 1 Generally Available Mesh, Widths, and Colors

Product	Class	Nominal Yarn Diameter, µm [in.]	Standard Construction Warp by Fill Mesh/25.4 mm [Mesh/1 in.]	Standard Widths		Colors
				mm	in.	
Insect screening	1	292 [0.011]	18 × 16	610, 762, 813, 914, 1067, 1219, 1524, 1829, 2134	24, 30, 32, 36, 42, 48, 60, 72, 84	gray, charcoal
	2	330 [0.013]	18 × 14	914, 1219, 1524, 1829, 2134, 2438, 2743	36, 48, 60, 72, 84, 96, 108	gray, charcoal
	2	330 [0.013]	18 × 14	914, 1219, 1829, 2134	36, 48, 72, 84	aqua
	2	330 [0.013]	20 × 20	914, 1219, 1524, 1829, 2134	36, 48, 60, 72, 84	gray, charcoal
Louver cloth	2	330 [0.013]	Less than 12 × 12	152, 203, 305, 610, 914, 1219	6, 8, 12, 24, 36, 48	gray, charcoal

2.3 ANSI/ASQC Standards:⁵

[ANSI/ASQC Z1.4 Sampling Procedures for Inspection by Attributes](#)

[ANSI/ASQC Z1.9 Sampling Procedures and Tables for Inspection Variables for Percent Nonconforming](#)

2.4 Federal Standards:⁶

[CCC-D-950 Specification, Dyeing and After Treating Processes for Cotton Cloths](#)

[Test Method Standard No. 191a, Textile Test Methods, Method 5872 Effect of High Temperature on Cloth Blocking](#)

[Standard 595A CHG Not 1, Color Volume 1](#)

2.5 IFAI (Industrial Fabrics Association International)⁷

[CPAI-84 Specification for Flame-Resistant Materials Used in Camping Tentage](#)

4.2.1 For vinyl-coated glass yarn insect screening not listed in [Table 1](#), the mesh, width, and colors shall be agreed upon between the purchaser and supplier.

5. Sampling and Test Specimens

5.1 *Sampling*—On a continual basis, samples are selected randomly from each mesh and tested to insure compliance, unless otherwise agreed upon between the purchaser and the supplier.

5.2 *Test Specimens*—For insect screening or louver cloth appearance, width, and length testing, a roll shall serve as the test specimen. For other properties, take the test specimen(s) from the roll. No specimen shall be taken closer than 25 mm [1 in.] from the edge or 0.9 m [1 yd] from the end of the roll.

3. Terminology

3.1 For all terminology relating to D13.18, Glass Fiber and Its Products, refer to Terminology [D7018/D7018M](#).

3.1.1 The following terms are relevant to this standard: atmosphere for testing textiles, insect screening, louver cloth, mesh.

3.2 For all other terms related to textiles, refer to Terminology [D123](#).

4. Classification

4.1 Vinyl-coated glass yarn insect screening is produced in two basic classes and mesh to afford required strength and insect protection using yarns as directed in Specification [D3374/D3374M](#). These two classes are as follows:

4.1.1 *Class 1*—Insect screening woven from vinyl-coated glass yarn having a nominal thickness of 0.292 mm [0.0115 in.].

4.1.2 *Class 2*—Insect screening woven from vinyl-coated glass yarn having a nominal thickness of 0.330 mm [0.013 in.].

4.2 The mesh, width, and colors are listed in [Table 1](#).

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁶ Available from General Services Administration, Specifications and Consumer Information Distribution Section (WFSIS), Washington Navy Yard, Bldg. 197, Washington, DC 20407.

⁷ Available from Industrial Fabrics Association International (IFAI), 1801 County Road B W, Roseville, MN 55113-4061, <https://www.ifai.com>.

REQUIREMENTS

6. General Requirements

6.1 Material:

6.1.1 *Workmanship*—Insect screening or louver cloth shall be made utilizing input yarns that meet the requirements specified in Specification [D3374/D3374M](#). Products may contain a maximum of one defect in the filling direction affecting less than 50 lineal mm [2 lineal in.]. Examples of defects are listed in [Table 2](#).

6.1.2 *Plasticizers*—The material used to coat or impregnate the fibrous glass yarn shall be a compound of polymerized or copolymerized vinyl chloride resin, plasticized with phosphate or phthalate ester plasticizers exclusively, pigmented and stabilized to meet the requirements herein.

6.1.2.1 *Optional Plasticizer*—At the supplier's option, plasticizers other than phosphates and phthalates may be used provided the color is not affected and the coating compound is treated with solubilized copper 8 quinolinolate which is listed as inhibitor (e) in Federal Standard CCC-D-950. The amount of fungicide shall be based on the nonvolatile content of the coating. The coating compound shall be chemically analyzed for copper 8 quinolinolate content in accordance with Federal Standard CCC-D-950.

6.1.3 *Color*—The maximum and minimum shades limits shall be defined by color designations listed in Federal Standard 595A as agreed upon between the purchaser and supplier.

6.1.3.1 The color designated grey shall fall between No. 36492 and No. 36173 as listed in Federal Standard 595A.

TABLE 2 Examples of Defects^{A,B}

Bias or bowed filling: For widths ≤ 1220 mm [48 in.] ≥ 13 mm [0.5 in.] For widths > 1220 mm [48 in.] ≥ 25 mm [1.0 in.]	Slack or tight selvage ^{A,B}
Broken or missing strand (end or pick), ^{A,B}	Splice—more than one in a 300 mm ² [1 ft ²] area ^B
Damaged selvage extending into the body of the screening ^B	Splice more than 25 mm [1 in.] in length ^B
Heavy strand ^{A,B}	Splice not well made and showing tails ^B
Jerked-in filling, slough-off, or kinky filling ^{A,B}	Spot, stain, or streak ^{A,B}
Color bands ^B	Thin strand ^{A,B}
	Tight strand (end or pick) ^{A,B}
	Uncoated yarns ^B

^A For definitions of terms used in this table, refer to Terminology D123.

^B At normal inspection distance approximately 900 mm [3 ft].

6.1.4 *Selvage*—Vinyl-coated glass insect screening and louver cloth may be supplied with or without selvages as agreed between the purchaser and supplier.

6.1.5 *Yarn Splices*—Vinyl-coated glass yarn splices shall be permitted provided they show no tails and do not exceed 25 mm [1 in.] in length. Yarn splices in the insect screening or louver cloth shall not exceed 15 per standard 30 m [100 ft] roll, and no more than one splice shall occur in any 930 cm² [1 ft²] of product.

6.2 *Put-Up*—Vinyl-coated glass yarn insect screening and louver cloth shall be put-up on rolls that may be placed in containers whose dimensions shall be agreed upon between the purchaser and the supplier.

7. Physical Requirements

7.1 *Appearance*—Unless otherwise agreed upon between the purchaser and the supplier, a roll shall be defective if it contains two or more defects as described in 6.1.1.

7.2 *Mesh*—The standard average mesh shall be approximately even-spaced as specified in Table 1 ±0.5 mesh per 25 mm [1 in.]. There are no tolerance requirements within 13 mm [0.5 in.] of the selvage.

7.3 *Roll Length*—Each roll of insect screening or louver cloth complying with Specification D3656/D3656M shall contain 30 linear m –0, +0.6 m [100 linear ft –0, +2.1 ft].

7.4 *Width*—The standard average roll width shall be as specified in Table 1 +7 or –0 mm [+0.25 in. or –0 in.].

7.5 *Mass per Unit Area*—The minimum average mass per unit area for each class shall be as specified in Table 3.

7.6 *Flame Resistance*—There shall be no propagation of flame along any specimen for longer than 10 s after removal of the flame source and no single specimen may propagate flame along its entire length in any time increment.

7.7 *Fabric Stability*—The yarns shall be bonded at each contact point. The fabric stability of the finished product shall be determined in accordance with Test Method D4912/D4912M and meet the requirements as specified in Table 3.

7.8 *Bursting Strength*—The minimum average bursting strength of the finished product in its original state and after 480 h of exposure to color stability after accelerated weathering as directed in Section 19 shall be as specified in Table 3.

7.9 *Stiffness Index*—The minimum and maximum average stiffness values are referenced in Table 4.

TABLE 3 Minimum Sample Average Mass and Strength Properties

Property	Insect Screening		Louver Cloth	
	Class 1	Class 2	Class 2	Class 2
	18 × 16 Mesh/25.4 mm [1 in.]	18 × 14 Mesh/25.4 mm [1 in.]	20 × 20 Mesh/25.4 mm [1 in.]	8 × 8 Mesh/25.4 mm [1 in.]
Mass per unit area, g/m ² [oz./yd ²]	102 [3.0]	146 [4.3]	176 [5.2]	68 [2.0]
Fabric Stability, 50 mm, N [2 in., lbf]				
Warp	36 [8]	44 [10]	53 [12]	22 [5]
Fill	27 [6]	36 [8]	44 [10]	22 [5]
Minimum average bursting strength before and after 480-h exposure ^A kPa [psi]	448 [65]	690 [100]		

^A After 480 h exposure as directed in Section 17.

TABLE 4 Nominal Stiffness

	Stiffness MG ^A	
	Min	Max
Insect screening		
Class 1	40	120
Class 2	60	180
Louver cloth		
Class 2	40	120

^A These values are for design or informational purposes only.

7.10 *Color Stability after Accelerated Weathering*—The change from the original color of the standard gray and charcoal, after 480 h of accelerated weathering exposure shall be no greater than step 3, and after 960 h of accelerated weathering exposure shall be no greater than step 2, on the AATCC Gray Scale for evaluating change in color.

NOTE 1—Use of other types of weathering apparatus may give weathering characteristics that are not equivalent to the preferred apparatus.

7.10.1 Exposure periods and acceptable changes in color other than the standard gray and charcoal shall be as agreed upon between the purchaser and the supplier.

7.11 For vinyl-coated glass yarn insect screening and louver cloth not listed in Table 1, the physical properties shall be agreed upon between the purchaser and the supplier except as noted in 6.2.

TEST METHODS

8. Conditioning

8.1 Condition the laboratory samples without preconditioning for a period of at least 5 h in the atmosphere for testing glass textiles as directed in Practice **D1776/D1776M**, unless otherwise specified.

NOTE 2—In any event, 24 h is considered ample exposure time to bring the samples to moisture equilibrium.

9. Put-Up

9.1 Verify that the rolls and shipping containers conform to the inspection agreement in the purchaser's plant.

10. Appearance

10.1 Before doing any other testing, determine the appearance as directed in the procedure described in Specification **D4028/D4028M**. Count all defects of the types as described in **6.1.1** and in **Table 2** regardless of their proximity to each other, except where two or more defects represent a single local condition in the screening. In such cases, count only the most serious defect.

11. Mesh

11.1 Determine the mesh as directed in Test Method **D3775**. Count the number of warp yarns in 25 mm [1 in.] of fabric width in five randomly designated places across the width of each roll. Count the number of filling picks in 25 mm [1 in.] of fabric length in five randomly designated places in each laboratory sample.

12. Roll Length

12.1 Determine the length for each roll to be tested using the clock method as directed in Test Methods **D3773/D3773M**, Option C.

13. Width

13.1 Determine the fabric width as directed in Test Method **D3774**, Option A. Measure the width of the screening at five evenly spaced points along the length of the roll. Make no measurements within 0.9 m [1 yd] of the ends of the roll.

14. Mass per Unit Area

14.1 Determine the mass per unit area of test specimens taken from the roll as directed in Test Methods **D3776/D3776M**, Option C.

15. Flame Resistance

15.1 Determine the flame resistance as directed in the procedure for wall and top materials in Specification **D4372** or CPAI Test Method 84 (CPAI-84). Test eight specimens from each roll to be tested, with four from the warp and four from the filling direction of the material. Cut the specimens 70 mm by 305 mm \pm 2 mm [2.75 in. by 12 in. \pm 0.062 in.] with the long dimension of the specimen in the direction to be tested and with different warp ends in each of the warp specimens and different filling picks in each of the filling specimens.

16. Fabric Stability

16.1 Test 10 specimens from each roll to be tested as directed in Test Method **D4912/D4912M**. Cut the specimens 50 mm by 125 mm \pm 2 mm [2 in. by 5 in. \pm 0.062 in.] with the long dimension of the specimen in the direction to be tested and with different warp ends in each of the warp specimens and different filling picks in each of the filling specimens.

17. Bursting Strength

17.1 *General*—Determine the bursting strength as directed in Test Method **D3786/D3786M** using a Model A, motor-driven, bursting apparatus consisting of the following:

17.1.1 Means for clamping the test specimen between annular, plane surfaces having fine concentric tool marks to minimize slippage. The upper clamping platen shall have a diameter of 9.5 mm [3.75 in.], a thickness of 9.5 mm [3.75 in.], and a circular opening 31.50 mm \pm 0.025 mm [1.240 in. \pm 0.001 in.] in diameter. The lower edge of the opening (side in contact with the material) shall have a 0.064 mm [0.0025 in.] radius. The lower clamping surface (diaphragm plate) shall have a thickness of 5.56 mm \pm 0.08 mm [0.219 in. \pm 0.003 in.] with an opening 31.50 mm \pm 0.02 mm [1.240 in. \pm 0.001 in.] in diameter. The upper edge of the opening (in contact with the material) shall have a 0.4 mm [0.016 in.] radius, and the lower edge of the opening (in contact with the rubber diaphragm) a radius of 3.2 mm [0.125 in.] to prevent cutting the rubber when pressure is applied. The upper clamping ring shall be connected to the clamping mechanism through a swivel joint to facilitate an even clamping pressure. The openings in the two clamping plates shall be concentric to within 0.13 mm [0.005 in.] and their clamping faces shall be flat and parallel.

17.1.2 Prepare a gasket for each the upper and the lower clamping plates having an opening that is 1.6 mm [0.062 in.] larger than the aperture openings of the upper and lower clamping surfaces. The recommended gasket material is 1.6 mm [0.062 in.] No 777 C. I. rubber sheet (hardness of 80 \pm 5 Type A Durometer reading). Cement gaskets to the upper and lower plates using a rubber adhesive.

17.1.3 Equip the machine with a Type D or C/R diaphragm requiring a pressure of not less than 160 kPa [23 psi] nor more than 210 kPa [30 psi] to distend to a height of 9.5 mm [0.375 in.] above the diaphragm plate.

17.1.4 A means of forcing liquid into the pressure chamber below the diaphragm at a steady rate of 170 mL/min. This pressure shall be generated by a motor driven piston forcing a liquid glycerin into the pressure chamber of the apparatus.

17.2 Procedure:

17.2.1 Cut at least six specimens of sufficient size from each laboratory sampling unit, such that the smallest dimension is at least 110 mm [4.25 in.].

17.2.2 Expose one specimen from each exposure condition in Section 19. Retain one specimen for control (unexposed) test.

NOTE 3—It is advisable to expose extra specimens in case slippage occurs during the bursting test.