Designation: D579/D579M – 24

Standard Practice for Greige Woven Glass Fabrics[1]

This standard is issued under the fixed designation D579/D579M; 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 practice covers greige fabrics woven from "E" electrical glass fiber yarns. This practice can also be applied to fabrics made of other glass fiber types as agreed upon between the purchaser and the supplier.

1.2 This practice specifies the terminology, definitions, general requirements and physical requirements for greige glass fiber fabrics. This practice permits the application of organic materials to the glass fiber yarn during manufacture that helps facilitate weaving.

1.3 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.

1.4 This practice is one of a series to provide a substitute for Military Specifications: MIL-Y-1140 Yarn, Cord, Sleeving, Cloth, and Tape-Glass and MIL-C-9084 Cloth, Glass Finished for Resin Laminates.

1.5 Additional ASTM practices in this series have been drafted and appear in current editions of the Annual Book of ASTM Standards. These include finished glass fabrics, unfinished glass fabrics, glass tapes, glass sleevings, glass cords, glass sewing threads, and finished laminates made from finished glass fabrics.

1.6 *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.*

1.7 *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

D578/D578M Specification for Glass Fiber Strands

D579/D579M Specification for Greige Woven Glass Fabrics

D1059 Test Method for Yarn Number Based on Short-Length Specimens

D1423/D1423M Test Method for Twist in Yarns by Direct-Counting

D1776/D1776M Practice for Conditioning and Testing Textiles

D1777 Test Method for Thickness of Textile Materials

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

D4963/D4963M Test Method for Ignition Loss of Glass Fiber Strands and Fabrics

D5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)

D7018/D7018M Terminology Relating to Glass Fiber and Its Products (Withdrawn 2021)[3]

2.2 *ANSI Standards:*

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

2.3 *Military Standard and Specifications:*

MIL-Y-1140H Yarn, Cord, Sleeving, Cloth and Tape-Glass[5]

MIL-C-9084C Cloth, Glass Finished for Resin Laminates[5]

[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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[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 National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[5] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

2.4 *Textile Institute Documents:*
Textile Terms and Definitions[6]
Woven Cloth Construction[6]

3. Terminology

3.1 For all terminology relating to D13.18, Glass Fibers and Its Products, refer to Terminology D7018/D7018M.

3.1.1 The following terms are relevant to this specification: atmosphere for testing textiles, continuous filament, crowfoot weave, eight-harness satin, greige goods, leno weave, mock leno weave, twelve-harness satin.

3.2 For all other terms related to textiles, see Terminology D123.

4. Significance and Use

4.1 This practice lists physical properties of typical 'E" glass greige woven glass fabrics by commercial style designation that details fabric count, yarn specifications in tex, fabric weave type, mass per unit area, thickness and breaking force.

4.1.1 The fabric weave type is important. It can affect the performance of the final product depending on its end use in terms of force, durability and aesthetics. This practice details how to recognize specified weaves such as crowfoot, plain, leno, mock leno, eight-harness satin and twelve-harness satin.

4.1.2 This practice also details a method to classify of major and minor fabric defects by appearance. This method for determining fabric appearance is extensively used in trade and considered satisfactory for acceptance testing of commercial shipments. In case of disagreement arising from differences in values reported by the purchaser and the supplier when using this method for acceptance testing, the statistical bias, if any, between the examination station of the purchaser and the examination station of the supplier should be determined with each comparison being based on the examination results of inspection of the same rolls of fabric.

5. Classification

5.1 The designation of a fabric should be by style numbers that are standard throughout the industry. Generally used style numbers are listed in numerical order in Table 8.

[6] Available from the Textile Institute, 10 Blackfriars St., Manchester, M3 5DR England.

TABLE 1 Twist Tolerances

	Tolerances
Turns per Centimeter:	
From zero to 0.4, incl	±0.1 turn per centimeter
Over 0.4 and up to and including 4.0	±0.2 turn per centimeter
Over 4	±5.0 % of the specified average twist
Turns per Meter:	
From zero to 40, incl	±10 turns per meter
Over 40 and up to and including 400	±20 turns per meter
Over 400	±5.0 % of the specified average twist
Turns per Inch:	
From zero to 1, incl	±0.25 turn per inch
Over 1 and up to and including 10	±0.5 turn per inch
Over 10	±5.0 % of the specified average twist

TABLE 2 Tolerances—Mass/Unit Area

Nominal Mass/Unit Area, g/m^2 [oz/yd^2]	Permissible Variation, %
136 [4.0] and under	±10
Over 136 [4.0]	±6

TABLE 3 Tolerances—Thickness

Nominal Thickness	Permissible Variations
millimeters	
0.075 and under	±0.013
Over 0.075 to 0.250	±0.025
Over 0.250 to 0.380	±0.050
Over 0.380	±0.075
inches	
0.0030 and under	±0.0005
Over 0.0030 to 0.0100	±0.0010
Over 0.0100 to 0.0150	±0.0020
Over 0.0150	±0.0030

6. Requirements

The designation of a fabric should be by style numbers that are standard throughout the industry. Generally used style numbers are listed in numerical order in Table 8.

7. Material

7.1 The yarn should be continuous filament, unless otherwise specified, free of any free alkali metal salts, such as soda or potash, and foreign particles, dirt, and other impurities.

7.2 Accept the supplier's certification that the material is of the correct grade as specified in Specification D578/D578M. Unless otherwise specified, during testing for strand construction as directed in Section 10, verify that the yarn is continuous filament. Determine the freedom from objectionable impurities during the inspection for fabric appearances as directed in Section 22.

8. Fabric Count

8.1 For fabrics listed in Table 8, the nominal fabric count should conform to the requirements of Table 8. For fabrics not listed in Table 8, the nominal fabric count should be agreed upon between the purchaser and the supplier. The average count of warp ends should be within two ends of the nominal count, and the average count of the filling picks should be within two picks of the nominal count.

9. Yarn Designations

9.1 For fabrics listed in Table 8, the yarn designations should conform to the requirements of Table 8. For fabrics not listed in Table 8, the yarn designations should be agreed upon between the purchaser and the supplier. The requirements of the individual elements of the designation are specified in Sections 10 – 14.

9.1.1 In some cases ECE 225 yarn is specified in Table 8. ECD 225 may be substituted with no significant decrease in property performance.

TABLE 4 Classification of Defects[A]

Defect	Description	Major	Minor
Bias or bowed filling	Pick line distortion from horizontal by more than 2.5 % for entire width	X	
Baggy, ridged, or wavy cloth	Clearly noticeable	X	
Cut or tear	6.5 mm [0.25 in.] or more in any direction (body only)	X	
Hole	13 mm [0.5 in.] or more in diameter	X	
	Less than 13 mm [0.5 in.] in diameter		X
Spots, streaks, or stains, foreign inclusions	Clearly noticeable	X	
Tender or weak spot	Clearly noticeable 50 mm [2 in.] or more in combined directions	X	
	Clearly noticeable less than 50 mm [2 in.] but greater than 6.5 mm [0.25 in.] in combined directions		X
Smash	76 mm [3 in.] or more in combined directions	X	
	Less than 76 mm [3 in.] in combined directions		X
Broken, missing ends or picks	2 or more contiguous regardless of length	X	
Floats and skips	50 mm [2 in.] or more in combined directions	X	
	Less than 50 mm [2 in.] in combined directions		X
Light marks	Greater than 6.5 mm [0.25 in.] in width	X	
	2 picks less than nominal pick construction		X
Heavy marks	Puckering clearly noticeable	X	
	2 picks more than nominal pick construction		X
Crease	Hard embedded and folded over on self	X	
Waste	Clearly noticeable over 6.5 mm [0.25 in] in length	X	
	Clearly noticeable less than 6.5 mm [0.25 in.] in length		X
Weave separation	Clearly noticeable 3 mm [0.125 in.] or more	X	
Brittle or fused area	Any	X	
Selvage Defects	Curled or folded under		X
	Cut or torn less than 6.5 mm [0.25 in.] in length		X
	Cut or torn 6.5 mm [0.25 in.] and over in length	X	
Selvage leno ends out	Greater than 5 m [5 yd] missing (continuously)	X	
	Less than 5 m [5 yd] missing		X
Feather edge	Greater than 5 mm [0.1875 in.] running more than 5 m [5 yd]	X	
	Greater than 5 mm [0.1875 in.] but running less than 5 m [5 yd]		X

[A] At a normal viewing distance of 1 m or 3 ft.

TABLE 5 Sample Size Determination for Construction, Mass, Width, and Physical Properties

Lot Size in Units, m or [yd]	Sample Size, Number of Units (Rolls)
800 or less	2
801 up to and including 22 000	3
22 001 and over	5

10. Yarn Number

10.1 For fabrics listed in Table 8, the nominal size-free yarn numbers of the yarns designated should conform to Specification D578/D578M. For fabrics not listed in Table 8, the nominal size-free yarn number should be agreed upon between purchaser and supplier.

10.2 Determine the yarn number in tex [yards per pound] for both the warp and filling yarns as directed in Test Method D1059.

11. Filament Diameter

11.1 The nominal filament diameter for yarns in the fabric should conform to the nominal range for filament diameter average values specified in Table 1 of Specification D578/D578M.

11.2 Determine the filament diameter for both the warp and filling yarns as directed in Specification D578/D578M by using 50 individual filaments from one yarn test specimen from both the warp and filling yarns in each of the swatches in the laboratory sample.

12. Strand Construction

12.1 The basis for specifying strand construction is given in Specification D578/D578M. For fabrics listed in Table 8, the construction of the component strands should conform to the requirements of Table 8. For fabrics not listed in Table 8, the construction of the component strands should be agreed upon between the purchaser and the supplier.

12.2 Verify the number of singles strands and the number of plied or cabled strands on one test specimen of warp yarn and one specimen of filling yarn while determining the twist direction or twist level.

13. Direction of Twist

13.1 Unless otherwise agreed upon between the purchaser and the supplier, the primary twist in the singles strands should be “Z” twist and the final twist in the plied yarns should be “S” twist.

13.2 Verify the direction of twist in each strand of the yarns as directed in Test Method D1423/D1423M in each of five test specimens of warp and filling yarns taken from each of the swatches in the laboratory sample.

14. Twist Level

14.1 The nominal twist in the component strands and the finished yarns should conform to the requirements of Table 8 in Specification D578/D578M. The tolerances for the primary twist and the final twist should conform to Table 1 of this document unless otherwise agreed upon between the purchaser and the supplier.

TABLE 6 Values of *b* for Critical Differences in Defect Counts, *a* and *b*, for Two Test Results

Probability Level			Probability Level			Probability Level			Probability Level		
r = *a* + *b*	90 %	95 %	*r* = *a* + *b*	90 %	95 %	*r* = *a* + *b*	90 %	95 %	*r* = *a* + *b*	90 %	95 %
1			26	8	7	51	19	18	76	30	28
2			27	8	7	52	19	18	77	30	29
3			28	9	8	53	20	18	78	31	29
4			29	9	8	54	20	19	79	31	30
5	0		30	10	9	55	20	19	80	32	30
6	0	0	31	10	9	56	21	20	81	32	31
7	0	0	32	10	9	57	21	20	82	33	31
8	1	0	33	11	10	58	22	21	83	33	32
9	1	1	34	11	10	59	22	21	84	33	32
10	1	1	35	12	11	60	23	21	85	34	32
11	2	1	36	12	11	61	23	22	86	34	33
12	2	2	37	13	12	62	24	22	87	35	33
13	3	2	38	13	12	63	24	23	88	35	34
14	3	2	39	13	12	64	24	23	89	36	34
15	3	3	40	14	13	65	25	24	90	36	35
16	4	3	41	14	13	66	25	24	91	37	35
17	4	4	42	15	14	67	26	25	92	37	36
18	5	4	43	15	14	68	26	25	93	38	36
19	5	4	44	16	15	69	27	25	94	38	37
20	5	5	45	16	15	70	27	26	95	38	37
21	6	5	46	16	15	71	28	26	96	39	37
22	6	5	47	17	16	72	28	27	97	39	38
23	7	6	48	17	16	73	28	27	98	40	38
24	7	6	49	18	17	74	29	28	99	40	39
25	7	7	50	18	17	75	29	28	100	41	39

Probability levels are for two-sided limits.If the observed value of |Lm the tabulated value, the two test results should be considered significantly different at the indicated probability level.

a = the larger of two defect counts, each of which is the total count for all specimens in a test result and each of which is based on the same number of specimens,
b = the smaller of the two defect counts taken as specified for *a*, and
r = *a* + *b*.

When *r* > 100, use the following approximation:

$$b = c - 1 - k\sqrt{c}$$

where:

b = calculated value of *b*, rounded to the nearest whole number,
c = *r*/2, and
k = 1.386 and 1.163 respectively for the 95 % and 90 % probability levels.

14.2 Determine the twist level in each of the component strands as directed in Test Method D1423/D1423M upon five test specimens of warp yarn and five test specimens of filling yarn from each of the swatches in the laboratory sample.

15. Fabric Weave Type

15.1 For fabrics listed in Table 8, the fabric weave type should conform to the requirements of Table 8. For fabrics not listed in Table 8, the fabric weave type should be agreed upon between the purchaser and the supplier.

15.2 The fabric weave type is important. It can affect the performance of the final product depending on its end use in terms of force, durability and aesthetics. There is a procedure for recognizing specified weaves and it is considered satisfactory for acceptance testing of commercial shipments.

15.3 *Apparatus:*

15.3.1 Rectangular coordinate graph paper.

15.3.2 Linen or magnifying glass.

15.3.3 Marking pen or pencil.

15.4 *Procedure:*

15.4.1 Place a swatch of the sample on a flat surface, face side up (see Terminology D7018/D7018M for definitions relative to Eight and Twelve Harness Satins). Position the swatch with the warp direction extending forward and away from the observer.

15.4.2 Select a starting point on the surface of the fabric where a warp end is raised over a filling pick (raiser yarn).

15.4.3 Denote a filling end raised over a warp end (Sinker yarn) on the face of the fabric by an unmarked block.

15.4.4 Plot the weave construction by first marking a block on the graph paper designating the starting raiser yarn.

15.4.5 Continue plotting from left to right, from the first raiser yarn, showing raiser yarns as marked blocks and sinker yarns as unmarked blocks until a minimum of two repeats of the pattern are observed. In a like manner, plot up from the first raiser yarn until a minimum of two repeats of the pattern are observed corresponding to each designated block in the left-to-right pattern.

15.4.6 Compare the design plot to Figs. A1.1-A1.6.

15.4.6.1 Leno and mock leno have a distinct visual appearance and may be identified without plotting.

TABLE 7 95 % Confidence Limits for Number of Defect Counts per Test Result

Observed Count	Lower Limit	Upper Limit
0	0.0	3.7
5	1.6	11.7
10	4.8	18.4
15	8.4	24.7
20	12.2	30.9
25	16.2	36.9
30	20.2	42.8
35	24.4	48.7
40	28.6	54.5
45	32.8	60.2
50	37.1	65.9
60	45.8	77.2
70	54.6	88.4
80	63.4	99.6
90	72.4	110.6
100	81.4	121.6
120	99.5	143.5
140	117.8	165.2
160	136.2	186.8
180	154.7	208.3
200	173.2	229.7

$$\text{Lower confidence limit for counts} = c[1 - (1/9c) - t(1/9c)^{1/2}]^3$$
$$\text{Upper confidence limit for count} = d[1 - (1/9d) + t(1/9d)^{1/2}]^3$$

where:

c = observed number of counts,
d = $c + 1$, and
t = 1.960, the value of Student's t for infinite degrees of freedom, two-sided limits, and the 95 % probability level.

15.5 *Report:*

15.5.1 State that the fabric weave type of the rolls of fabric was determined as directed in Section 15 of Specification D579/D579M. Describe the material or product sampled and the method of sampling used.

15.5.2 Report the fabric weave type for each roll including the raiser/sinker pattern in terms of the warp ends up and down.

16. Mass Per Unit Area

16.1 For fabrics listed in Table 8, the nominal mass per unit area should conform to the requirement of Table 8. For fabrics not listed in Table 8, the nominal mass per unit area should be agreed upon between the purchaser and the supplier. The average mass per unit area for the lot should conform to the requirements of Table 2.

16.2 Determine the mass per unit area of the fabric as directed in Test Method D3776/D3776M, Option A, using each of the rolls in the laboratory sample.

17. Thickness

17.1 For fabrics listed in Table 8, the nominal thickness should conform to the requirements of Table 8. For fabrics not listed in Table 8, the nominal thickness should be agreed upon between the purchaser and the supplier. The average thickness of the fabric in the lot should conform to the requirements of Table 3, unless specified otherwise.

17.2 Determine the thickness of the fabric as directed in Test Method D1777, using ten test specimens from each swatch in the laboratory sample.

17.3 For glass fabrics and tapes made with continuous filament yarns, use Table 1 Option 3 of Method D1777. For fabrics made with textured or open-end yarns, use Table 1 Option 1 of Method D1777.

18. Breaking Force

18.1 For fabrics listed in Table 8, the minimum breaking force should conform to the requirements of Table 8. For those fabrics in which breaking force is not listed in Table 8, the minimum breaking force should be agreed upon between the purchaser and the supplier. The average breaking force for the lot shall exceed the specified breaking force, and no individual break should be less than 80 % of the specified minimum breaking force.

18.2 Determine the breaking force in newtons per 25 mm [or pounds-force per inch] of fabric in both the warp and filling directions as directed in Test Method D5035. There may be no overall correlation between the results obtained with the CRE machine and the CRT machine. Consequently, these two testers cannot be used interchangeably. In case of controversy the CRE tensile tester should prevail.

18.2.1 The use of hydraulic pneumatic clamping systems with 50 mm by 75 mm [2 in. by 3 in.] serrated jaw faces is recommended for testing samples prepared as directed in 18.5 and 18.6. The 50 mm [2 in.] dimension of the jaw face should be in the direction of test. Manual clamping is permitted.

NOTE 1—When using jaw faces other than serrated, minimize crushing and cutting of the glass yarns in the test specimens by lining the inside surface of the jaws with cardboard 0.25 mm to 0.40 mm [0.010 in. to 0.015 in.] in thickness or moleskin. Secure the end of the jaws with pressure-sensitive tape.

18.3 Prepare specimens as directed in 18.4, 18.5, or 18.6, as applicable.

18.4 *Procedure 1*—Procedure 1 is for fabrics having breaking forces of 445 N/25 mm [100 lbf/in.] or less.

NOTE 2—Fabrics having breaking force less than 445 N/25 mm [100 lbf/in.] can be prepared as outlined in 18.5 with no effect on the obtained value. Preparation Procedure 1 is provided to allow for a lower test specimen preparation cost when extensive preparation is not required.

18.4.1 *Reagents and Materials:*

18.4.1.1 *Butyl Methacrylate Solution*—is prepared by mixing 45 parts by mass of butyl methacrylate with 55 parts by weight of toluene or xylene and adding a small amount of oil-soluble dye. The viscosity of this solution should be about mPa·s (3000 cP), approximately that of honey at room temperature. It may be necessary to change the consistency for some types of fabrics to permit complete penetration of all interstices and to prevent capillary migration of the solution along the yarns into the test area.

NOTE 3—Substitute solutions can be used providing specimen damage does not occur or that specimens break or slip at the jaw faces.

18.4.1.2 **Warning—**Butyl methacrylate solution ingredients are flammable. Keep away from heat, sparks and open flame. Keep containers closed. Use only with adequate ventilation. Avoid prolonged breathing of vapor or spray mist. Avoid prolonged or repeated contact with skin. Spillage and fire instructions will depend on nature of solution.

18.4.1.3 *Multipurpose Paper,* 20 lb bond or greater (as needed to prevent slippage in the grips).

18.4.1.4 *Paint Brush,* 16 mm to 25 mm [0.6 in. to 1.0 in.] ,with bristles 25 mm [1 in.] long.

18.4.2 Cut two swatches of fabric from the laboratory sample each 200 mm by 250 mm [8 in. by 10 in.], one with the warp yarns and the other with filling yarns parallel to the 200 mm [8 in] direction

18.4.3 Lay each sample cut as directed in 18.4.2 on a piece of wrapping paper of similar size. Lay out five test specimens 38 mm by 150 mm [1.5 in. by 6 in.] on the fabric by drawing light lines with a soft, black wax pencil so that the yarns to be tested, warp or filling, are parallel to the longer direction. Draw lines across the specimens 40 mm [1.6 in] from each end, using very light pressure on the wax pencil to avoid possible damage to the surface filaments. Thoroughly impregnate the 40 mm [1.625 in.] specimen end strips with butyl methacrylate solution (or substitute) which must soak through the fabric in order to secure firm adhesion to the paper. Spread the solution in an even film to secure a uniform pressure from the testing machine jaws against the test specimen. Dry the impregnated sample slowly, 24 h without forcing, until the solvent is completely removed. Be sure to have the impregnant cover the cross lines to reinforce those sections where some of the surface fibers may have been fractured when those lines were drawn. On thick fabrics, paint both sides of the specimens by applying a coat of the impregnant to the back of the fabric or to the top surface of the backing paper.

18.4.4 Cut the 150 mm by 38 mm [6 in. by 1.5 in.] test specimen strips from the prepared sample without removing the paper backing. Ravel the central unimpregnated portion of the specimen to 25 mm [1 in.] in width as directed in Test Method D5035. After raveling, load samples in the test clamps, cut the 38 mm [1.5 in.] wide paper backing across midway between the ends, taking care not to damage the fabric specimen.

18.4.5 Cut the 150 mm by 38 mm [6 in. by 1.5 in.] test specimen strips from the prepared sample without removing the paper backing. Ravel the central unimpregnated portion of the specimen to 25 mm [1 in.] in width as directed in Test Method D5035. After raveling, load samples in the test clamps, cut the 38 mm [1.5 in.] wide paper backing across midway between the ends, taking care not to damage the fabric specimen.

NOTE 4—Raveling of the specimen can be facilitated by slitting each test specimen at its center, perpendicular to the yarn components severing all yarns except those in the central 25 mm [1 in.].

18.5 *Procedure 2*—Procedure 2 is for fabrics having breaking forces greater than 445 N/mm [100 lbf/in.] or tending to consistently break in, or slip from, the jaws when using Procedure 1 stated in 18.4.

18.5.1 Prepare test specimens as directed in 18.4 except as described in 18.5.2–18.5.10.

18.5.2 Substitute Sub 65 grade white cardboard in place of the wrapping paper.

18.5.3 Draw two legible lines 75 mm ± 1 mm [3.0 in. ± 0.05 in.] from each other and parallel across the center section of the cardboard.

18.5.4 Uniformly apply a resin solution on the cardboard along the drawn lines and outwards for a distance of 50 mm ± 1 mm [2.0 in. ± 0.05 in.] . Do not include the center 75 mm ± 1 mm [3.0 ± 0.05 in.] between the drawn lines.

NOTE 5—A mixture by weight of 60 parts Epoxy resin and 40 parts polyamide resin has been found suitable for this purpose.

18.5.5 Lay the cut swatches of fabrics each 200 mm by 250 mm [8 in. by 10 in.], one with the warp yarns and the other with the filling yarns parallel to the 200 mm [8 in.] direction, centrally and equally spaced on the resin prepared cardboard. The shorter direction of the sample is perpendicular to the drawn lines.

18.5.6 Uniformly reapply the resin mixture on the specimen directly above the first application.

18.5.7 Place a 50 mm ± 1 mm [2.0 in. ± 0.05 in.] by 250 mm [10 in.] strip of cardboard over the resin-impregnated area of the specimen. Allow to dry a minimum of 16 h.

NOTE 6—When substitute solutions are used, drying time may vary.

18.5.8 Cut five specimens, 150 mm by 38 mm [8.0 in. by 1.5 in.] in each of the warp and filling directions, and label accordingly, having the longer direction in the direction of test.

18.5.9 Ravel a sufficient number of yarns from each side of the specimen so that the central portion is a 25 mm [1.0 in.] width plus two yarns.

18.5.10 After the specimen is loaded in the test clamps, cut and ravel one yarn from each side of the test specimen and cut the cardboard backing across, midway between the ends, taking care not to damage the fabric specimen.

18.5.11 In the case of hydraulic pneumatic clamps, apply a pressure of 6750 N to 7650 N [1500 lbf to 1700 lbf] to the clamp faces. In the case of manual clamping, tighten sufficiently to prevent slippage of the test specimen.

18.6 *Procedure 3*—Procedure 3 is for fabrics having breaking forces greater than 2224 N/25 mm [500 lbf/in.] or that show cascading breaks across the specimen when using Procedure 2 stated in 18.5 or both.

NOTE 7—Glass yarns have a tendency to move within some fabrics when cut and handled in the greige state. This procedure is designed to ensure straightness of individual yarn components throughout the test.

18.6.1 Cut five specimens, 300 mm by 50 mm [12 in. by 2 in.] from the laboratory sample in each of the warp and filling directions, and label accordingly, having the longer direction in the direction of test.

18.6.2 Draw two legible lines 75 mm ± 1 mm [3.0 in. ± 0.05 in.] from each other and parallel to the long directions and across the center section of a 200 mm by 280 mm [8 in. by 11 in.] piece of Sub 65 white cardboard. Prepare one for each the warp and filling directions.

18.6.3 Place the cardboard sections at the outer edge of a workbench that is covered with a 0.19 mm [75 in.] thick piece of plywood. The 280 mm [11 in.] length is parallel to the bench edge.

18.6.4 Lay the cut specimens on the lined cardboard so that one end is 25 mm [1 in.] above the cardboard and the other end is hanging over the bench edge. Secure the top edge of the specimen to the plywood base by nailing through a 25 mm by