



Designation: D579 – 09

Standard Specification for Greige Woven Glass Fabrics¹

This standard is issued under the fixed designation D579; 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 Department of Defense.

1. Scope

1.1 This specification covers greige fabrics woven from “E” electrical glass fiber yarns. This specification can also be applied to fabrics made of other glass fiber types as agreed upon between the purchaser and the supplier.

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

1.3 This specification shows the values in both SI units and in inch-pound units. “SI units” is the technically correct name for the 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 in SI units are provided as information only; the values stated in inch-pound units are to be regarded as standard.

1.4 This specification 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 specifications 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 sleeveings, 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 and health practices and determine the applicability of regulatory limitations prior to use.*

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. Referenced Documents²

2.1 ASTM Standards:

- D123 Terminology Relating to Textiles
- D578 Specification for Glass Fiber Strands
- D1059 Test Method for Yarn Number Based on Short-Length Specimens
- D1423 Test Method for Twist in Yarns by Direct-Counting
- D1776 Practice for Conditioning and Testing Textiles
- D1777 Test Method for Thickness of Textile Materials
- D3773 Test Methods for Length of Woven Fabric
- D3774 Test Method for Width of Textile Fabric
- D3775 Test Method for Warp (End) and Filling (Pick) Count of Woven Fabrics
- D3776 Test Methods for Mass Per Unit Area (Weight) of Fabric
- D4963 Test Method for Ignition Loss of Glass Strands and Fabrics
- D5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
- D7018 Terminology Relating to Glass Fiber and Its Products

2.2 ANSI Standards:

- ANSI/ASQC Z1.4 Sampling Procedures for Inspection by Attributes³

2.3 Military Standard and Specifications:

- MIL-Y-1140H Yarn, Cord, Sleeving, Cloth and Tape-Glass⁴
- MIL-C-9084C Cloth, Glass Finished for Resin Laminates⁴

2.4 Textile Institute Documents:

- Textile Terms and Definitions⁵
- Woven Cloth Construction⁵

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

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

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

3. Terminology

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

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**.

CLASSIFICATION

4. Classification

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

REQUIREMENTS

5. Material

5.1 The yarn shall 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.

6. Fabric Count

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

7. Yarn Designations

7.1 For fabrics listed in **Table 8**, the yarn designations shall conform to the requirements of **Table 8**. For fabrics not listed in **Table 8**, the yarn designations shall be agreed upon between the purchaser and the supplier. The requirements of the individual elements of the designation are specified in Sections 8-12.

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

TABLE 1 Twist Tolerances

Tolerances	
Turns per Centimetre:	
From zero to 0.4, incl	±0.1 turn per centimetre
Over 0.4 and up to and including 4.0	±0.2 turn per centimetre
Over 4	±5.0 % of the specified average twist
Turns per Metre:	
From zero to 40, incl	±10 turns per metre
Over 40 and up to and including 400	±20 turns per metre
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
millimetres	
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

8. Yarn Number

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

9. Filament Diameter

9.1 The nominal filament diameter for yarns in the fabric shall conform to the nominal range for filament diameter average values specified in Table 1 of Specification **D578**.

10. Strand Construction

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

11. Direction of Twist

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

12. Twist Level

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

13. Fabric Weave Type

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

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 Less than 13 mm (0.5 in.) in diameter	X	
Spots, streaks, or stains, foreign inclusions	Clearly noticeable	X	X
Tender or weak spot	Clearly noticeable 50 mm (2 in.) or more in combined directions Clearly noticeable less than 50 mm (2 in.) but greater than 6.5 mm (0.25 in.) in combined directions	X	X
Smash	76 mm (3 in.) or more in combined directions Less than 76 mm (3 in.) in combined directions	X	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 Less than 50 mm (2 in.) in combined directions	X	X
Light marks	Greater than 6.5 mm (0.25 in.) in width 2 picks less than nominal pick construction	X	X
Heavy marks	Puckering clearly noticeable 2 picks more than nominal pick construction	X	X
Crease	Hard embedded and folded over on self	X	
Waste	Clearly noticeable over 6.5 mm (0.25 in.) in length Clearly noticeable less than 6.5 mm (0.25 in.) in length	X	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 Cut or torn less than 6.5 mm (0.25 in.) in length Cut or torn 6.5 mm (0.25 in.) and over in length		X X
Selvage leno ends out	Greater than 5 m (5 yd) missing (continuously) Less than 5 m (5 yd) missing	X	X
Feather edge	Greater than 5 mm (0.1875 in.) running more than 5 m (5 yd) Greater than 5 mm (0.1875 in.) but running less than 5 m (5 yd)	X	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

14. Mass Per Unit Area

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

15. Thickness

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

16. Breaking Strength

16.1 For fabrics listed in **Table 8**, the minimum breaking strength shall conform to the requirements of **Table 8**. For fabrics and/or breaking strength not listed in **Table 8**, the minimum breaking strength shall be agreed upon between the purchaser and the supplier. The average breaking strength for

the lot shall exceed the specified breaking strength, and no individual break shall be less than 80 % of the specified minimum breaking strength.

17. Width

17.1 Fabric width shall be agreed upon between the purchaser and the supplier. The fabric width, including both selvages but excluding any feathered edges, shall be no narrower than the specified width and no more than 13 mm (0.5 in.) wider than the specified width.

NOTE 1—During the processing of glass fabrics, the selvages may be slit to minimize tension influences. This slit distance is generally excluded when measuring the fabric width.

18. Length

18.1 The fabric roll length, length between splices, and number of splices per roll shall be agreed upon between purchaser and supplier. All splices must be thermoset unless otherwise agreed upon between the purchaser and supplier.

19. Ignition Loss

19.1 The ignition loss of greige fabric shall be less than 4.0 % unless otherwise agreed upon between the purchaser and the supplier.

20. Fabric Appearance

20.1 The woven greige fabric shall be generally uniform in quality and condition, clean, smooth, and free of foreign particles and defects detrimental to fabrication, appearance, or performance.

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 ILm 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.

20.2 The fabric in the laboratory sample for the fabric appearance shall be examined for the defects listed in **Table 4** and the acceptable quality levels (AQLs) are 2.5 major and 6.5 total (major and minor combined) defects per hundred units of fabric unless otherwise agreed upon between the purchaser and the supplier.

20.3 When specified, the warp direction of the fabric shall be marked by blue direction-indicator yarns running warpwise in the cloth and spaced approximately 150 mm (6 in.) apart.

21. Put-Up

21.1 Fabric shall be furnished in rolls and shall be wound on spiral tubes. The tube dimensions shall be as agreed upon between the purchaser and supplier. The maximum number of pieces contained in any roll shall be as specified in **18.1**.

22. Sampling

22.1 *Lot Size*—A lot shall consist of each 9000 m (10 000 yd) of a single fabric style unless otherwise agreed upon between the purchaser and the supplier.

22.1.1 When small multiple shipments are made from an inspected lot, the shipments may be made without additional inspection as agreed upon between the purchaser and the supplier.

22.2 *Lot Sample*—Take at random as a lot sample the number of rolls of fabric specified in **ANSI/ASQC Z1.4** and a single sampling plan, unless otherwise agreed upon.

22.3 *Laboratory Sample*—As a laboratory sample, take the following samples:

22.3.1 For fabric appearance, fabric width, mass per unit area, and fabric length, the rolls in the lot sample serve as the laboratory sample.

22.3.2 For other properties, take at random from the rolls in the lot sample the number of rolls specified in **Table 5**. From each roll in the laboratory sample, take a 1 m (1 yd) full-width swatch from the end of the roll after first discarding a minimum of 1 m (1 yd) of fabric from the very outside of the roll. Remove only the outer layer of fabric if the circumference of the roll is less than 1 m (1 yd).

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

Lower confidence limit for counts = $c[1 - (1/9c) - t(1/9c)^{1/2}]^3$
 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.

22.4 *Test Specimens*—For fabric appearance, fabric width, and fabric length, the rolls in the lot sample serve as test specimens. For other properties, take test specimens from the swatches in the laboratory sample as directed in the respective test methods in this specification.

23. Packaging

23.1 Each roll of fabric, put up as specified, shall be packaged to afford adequate protection against physical damage during shipment from the supply source to the receiving activity. The supplier may use his standard practice when it meets this requirement.

23.2 Unless otherwise agreed upon, as when specified in an applicable contract or purchase order, each roll shall be wrapped in polyethylene not less than 0.05 mm (0.002 in.) thick in such a manner as to ensure that the fabric, during shipment and storage, will be protected against damage from exposure to moisture, weather, or any other normal hazard.

24. Marking

24.1 Each package shall be marked to show the information listed below, unless specified otherwise by the purchaser and the supplier. Characters shall be of such size as to be clearly legible and shall not be obliterated by normal handling to:

- 100 % Fiber Glass Cloth
- Style
- Length
- Width
- Purchase Order Number
- Manufacturer's Identification

Finish Designation

24.1.1 All fabrics will be considered Type “E” electrical unless specified otherwise. If glass type is other than electrical “E,” each package shall be marked accordingly.

SAMPLING AND CONDITIONING

25. Conditioning

25.1 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**, unless otherwise specified.

TEST METHODS

26. Material

26.1 Accept the supplier's certification that the material is of the correct grade as specified in Specification **D578**. Unless otherwise specified, during testing for strand construction as directed in Section **30**, verify that the yarn is continuous filament. Determine the freedom from objectionable impurities during the inspection for fabric appearances as directed in Section **40**.

27. Fabric Count

27.1 Determine the fabric count as directed in Test Method **D3775**, making one count in each direction on each of the swatches in the laboratory sample.

28. Yarn Number

28.1 Determine the yarn number in tex (yards per pound) for both the warp and filling yarns as directed in Test Method **D1059**.

29. Filament Diameter

29.1 Determine the filament diameter for both the warp and filling yarns as directed in Specification **D578** 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.

30. Strand Construction

30.1 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.

31. Direction of Twist

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

32. Twist Level

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

33. Fabric Weave Type

33.1 *Scope*—This method covers the recognition of the six fabric weave types referred in [Table 8](#). The weaves included are: crowfoot, leno, mock leno, plain, eight-harness satin, and twelve-harness satin.

33.2 *Significance and Use*:

33.2.1 The fabric weave type is important. It can affect the performance of the final product depending on its end use in terms of strength, durability and aesthetics. This method specifies a procedure for recognizing specified weaves.

33.2.2 This procedure for recognizing fabric weave type is considered satisfactory for acceptance testing of commercial shipments.

33.3 *Apparatus*:

33.3.1 *Rectangular Coordinate Graph Paper.*

33.3.2 *Linen or Magnifying Glass.*

33.3.3 *Marking Pen or Pencil.*

33.4 *Procedure*:

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

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

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

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

33.4.5 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.

33.4.6 Compare the design plot to [Figs. A1.1-A1.6](#).

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

33.5 *Report*:

33.5.1 State that the fabric weave type of the rolls of fabric was determined as directed in Section [33](#) of Specification [D579](#). Describe the material or product sampled and the method of sampling used.

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

33.6 *Precision and Bias*—No justifiable statement can be made either on the precision or on the bias of this procedure since the procedure merely determines whether the weave in the test specimen conforms to that specified.

34. Mass Per Unit Area

34.1 Determine the mass per unit area of the fabric as directed in Test Method [D3776](#), Option A, using each of the rolls in the laboratory sample.

35. Thickness

35.1 Determine the thickness of the fabric as directed in Test Method [D1777](#), using ten test specimens from each swatch in the laboratory sample.

35.2 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](#).

36. Breaking Strength

36.1 Determine the breaking strength in newtons per 25 mm (or pounds-force per inch) of fabric in both the warp and filling directions as directed in Test Method [D7018](#). 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 shall prevail.

36.1.1 The use of hydraulic pneumatic clamping systems with 50 by 75-mm (2 by 3-in.) serrated jaw faces is recommended for testing samples prepared as directed in [36.4](#) and [36.5](#). The 50-mm (2-in.) dimension of the jaw face shall be in the direction of test. Manual clamping is permitted.

NOTE 2—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 to 0.40 mm (0.010 to 0.015 in.) in thickness or moleskin. Secure the end of the jaws with pressure-sensitive tape.

36.2 Prepare specimens as directed in [36.3](#), [36.4](#), or [36.5](#), as applicable.

36.3 *Procedure 1*—Procedure 1 is for fabrics having breaking strengths of 445 N/25 mm (100 lbf/in.) or less.

NOTE 3—Fabrics having breaking strength less than 445 N/25 mm (100 lbf/in.) can be prepared as outlined in [36.4](#) 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.

36.3.1 *Reagents and Materials*:

36.3.1.1 *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 4—Substitute solutions can be used providing specimen damage does not occur or that specimens break or slip at the jaw faces.

36.3.1.2 **Precaution**—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.

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

36.3.1.4 *Paint Brush*, 16 to 25 mm (0.6 to 1.0 in.) ,with bristles 25 mm (1 in.) long.

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