

CLOTH, TYPE "S" GLASS  
181 Style Fabric, Finish No. HTS-904

1. SCOPE:

1.1 Form: This specification covers "S" glass in one style of woven fabric with an HTS-904 finish.

1.2 Application: Primarily as a reinforcing material for structural plastic laminates. Suitable for use with phenolic and epoxy resin matrices.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM D123 - Terminology Relating to Textile Materials

ASTM D579 - Greige Woven Glass Fabrics

ASTM D1777 - Measuring Thickness of Textile Materials

ASTM D2410 - Finish Content of Woven Glass Fabric, Cleaned and After-Finished with Chrome Complexes, for Plastic Laminates

ASTM D3775 - Fabric Count of Woven Fabric

ASTM D3776 - Mass per Unit Area (Weight) of Woven Fabric

SAE Technical Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any particular infringement arising therefrom, is the sole responsibility of the user."

AMS documents are protected under United States and international copyright laws. Reproduction of these documents by any means is strictly prohibited without the written consent of the publisher.

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 General:

3.1.1 Color: Cloth shall be essentially white to light straw in color.

3.1.2 Finish: Immediately after filaments have been drawn from "S" glass, they shall be coated with a high-tensile-strength size, HTS-904, which will yield a product meeting the requirements of 3.1.1. The HTS-904 finish shall aid in wetting the fabric with resin and shall provide an intermediate chemical bond between the fabric and resin.

3.1.3 Yarn: Cloth shall be woven from SCG 150-1/2 yarn.

3.1.4 Weave: The weave shall be an eight-harness, satin weave in which each warp and fill yarn goes under one, and over seven, then under one, and repeat. The interweaving of the warp and fill yarns shall be staggered, i.e., the No. 1 warp yarn shall go under the No. 1, No. 9, No. 17, and subsequent fill yarns, and the No. 2 warp yarn shall go under the No. 2, No. 10, No. 18, and subsequent fill yarns.

3.2 Properties: Cloth shall conform to the following requirements:

3.2.1 Weight: 8.35 - 9.05 ounces/square yard      ASTM D3776  
(283 - 307 g/m<sup>2</sup>)

3.2.2 Nominal Thickness: 0.009 - 0.015 inch      ASTM D1777  
(0.23 - 0.38 mm)

3.2.3 Fabric Count:      ASTM D3775

Warp 55 - 59 ends per inch (25.4 mm)

Fill 52 - 56 ends per inch (25.4 mm)

3.2.4 HTS-904 Finish: 0.75 - 2.25%      ASTM D2410 (Specimen drying not required for this binder)

3.2.5 Breaking Strength, minimum:      ASTM D579 (Specimen drying not required for this binder)

Warp 500 pounds force/inch of width  
(88 kN/m of width)

Fill 450 pounds force/inch of width  
(79 kN/m of width)

3.3 Quality: Cloth, as received by purchaser, shall be uniform in quality and condition, smooth, and free from foreign materials and from imperfections detrimental to usage of the cloth.

3.3.1 Imperfections: In any 100 yards (91 m) of fabric supplied, there shall be no more than 10 major, or equivalent minor (2 minors = 1 major) imperfections, based on the following imperfection classification; definition of terms used herein are given in ASTM D123.

Imperfection	Description and Limitation	Classification
Bias or bowed filling	Distorted from horizontal by more than 3 inches (76 mm) for 38 inches (965 mm) widths and proportionately for all other widths	Minor
Baggy, ridgy, or wavy cloth	Clearly noticeable	Major
Cut or tear	2 inches (51 mm) or more in combined directions	Major
	Under 2 inches (51 mm) but over 1/4 inch (6.4 mm) in combined directions	Minor
Hole	1/2 inch (12.7 mm) or over in diameter	Major
	Under 1/2 inch (12.7 mm) in diameter	Minor
Spots, streaks, or stains	Clearly noticeable 2 inches (51 mm) or over in combined directions	Major
	Clearly noticeable under 2 inches (51 mm) in combined directions	Minor
Tender or weak spot	Clearly noticeable 2 inches (51 mm) or over in combined directions	Major
	Clearly noticeable under 2 inches (51 mm) but over 1/4 inch (6.4 mm) in combined directions	Minor
Smash	3 inches (76 mm) or over in combined directions	Major
	Under 3 inches (76 mm) in combined directions	Minor
Broken or missing ends or picks	3 or more contiguous regardless of length or 2 contiguous over 36 inches (914 mm) in length	Major
	2 contiguous under 36 inches (914 mm) in length	Minor

Imperfection	Description and Limitation	Classification
Floats	2 inches (51 mm) or over in combined directions	Major
	Under 2 inches (51 mm) in combined directions	Minor
Coarse or light place	Over 1/2 inch (12.7 mm) in width causing thickness outside of limits specified in 3.2.2	Minor
Selvage defects	Cut or torn	Major
	Curled or folded under	Minor
Crease	Hard, embedded, and folded over on self	Major
Brittle or fused area	Any	Major
Uneven finish	Thin areas where finishing compound is missing or insufficient	Major

3.4 Tolerances: The width shall be within  $\pm 1/2$  inch ( $\pm 12.7$  mm) from width ordered.

#### 4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of cloth shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cloth conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of cloth to a purchaser, on each lot, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling: Shall be as follows; a lot shall be all cloth produced in a single production run under the same fixed conditions and presented for vendor's inspection at one time:

4.3.1 Visual Examination of Rolls: 100% of each roll.

4.3.2 Fabric Tests: Samples for test shall be taken at random from each lot in accordance with Table I. Except as noted in 4.3.2.1, the number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.2.1 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.2 and the report of 4.5.1 shall state that such plan was used.

TABLE I

SAMPLE SIZE FOR TESTS OF GLASS CLOTH

Lot Size, Yards	Sample Size, Yards
Up to 3,200, incl	2
Over 3,200 to 22,000, incl	3
Over 22,000	5

TABLE I (SI)

Lot Size, Metres	Sample Size, Metres
Up to 2,926, incl	1.8
Over 2,926 to 20,117, incl	2.7
Over 20,117	4.6

4.4 Approval:

4.4.1 Sample cloth shall be approved by purchaser before cloth for production use is supplied, unless such approval be waived by purchaser. Results of tests on production cloth shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production cloth which are essentially the same as those used on the approved sample cloth. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample cloth. Production cloth made by the revised procedure shall not be shipped prior to receipt of reapproval.