

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 Aerospace Material Specifications 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 American Society for Testing and Materials, 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 Fabrics

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

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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 oz per sq yd ASTM D3776
(285 - 305 g per m²)

3.2.2 Nominal Thickness: 0.009 - 0.015 in. ASTM D1777
(0.22 - 0.38 mm)

3.2.3 Fabric Count: ASTM D3775

Warp 55 - 59 ends per in. (per 25.4 mm)
Fill 52 - 56 ends per in. (per 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, min: ASTM D579 (Specimen drying not
required for this
binder)

Warp 500 lb per in. of width
(90 kN/m of width)
Fill 450 lb per in. of width
(80 kN/m of width)

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

3.3.1 Imperfections: In any 100 yd (90 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:

| Imperfection | Description and Limitation | Classification |
|---------------------------------|---|----------------|
| Bias or bowed filling | Distorted from horizontal by more than 3 in. (75 mm) for 38 in. (950 mm) and proportionately for all other widths | Minor |
| Baggy, ridgy, or wavy cloth | Clearly noticeable | Major |
| Cut or tear | 2 in. (50 mm) or more in combined directions | Major |
| | Under 2 in. (50 mm) but over 1/4 in. (6 mm) in combined directions | Minor |
| Hole | 1/2 in. (12.5 mm) or over in diameter | Major |
| | Under 1/2 in. (12.5 mm) in diameter | Minor |
| Spots, streaks, or stains | Clearly noticeable 2 in. (50 mm) or over in combined directions | Major |
| | Clearly noticeable under 2 in. (50 mm) in combined directions | Minor |
| Tender or weak spot | Clearly noticeable 2 in. (50 mm) or over in combined directions | Major |
| | Clearly noticeable under 2 in. (50 mm) but over 1/4 in. (6 mm) in combined directions | Minor |
| Smash | 3 in. (75 mm) or over in combined directions | Major |
| | Under 3 in. (75 mm) in combined directions | Minor |
| Broken or missing ends or picks | 3 or more contiguous regardless of length or 2 contiguous over 36 in. (900 mm) in length | Major |
| | 2 contiguous under 36 in. (900 mm) in length | Minor |

| Imperfection | Description and Limitation | Classification |
|-----------------------|--|----------------|
| Floats | 2 in. (50 mm) or over in combined directions | Major |
| | Under 2 in. (50 mm) in combined directions | Minor |
| Coarse or light place | Over 1/2 in. (12.5 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 $\pm 1/2$ in. (± 12 mm) from that 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, processing, or both 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, the contracting officer, or the 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 2,925, incl | 1.8 |
| Over 2,925 to 20,100, incl | 2.7 |
| Over 20,100 | 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 material, processing, or both and, when requested, sample cloth. Production cloth made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports: