

AEROSPACE MATERIAL SPECIFICATION



AMS 3909A

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Superseding AMS 3909

(R)

Cloth, Aramid
Intermediate Modulus

1. SCOPE:

1.1 Form:

This specification and its supplementary detail specifications cover an intermediate modulus aramid yarn in the form of cloth.

1.2 Application:

This cloth has been used typically in construction of parachutes, but usage is not limited to such applications.

1.3 Classification:

The requirements specified herein and in the applicable detail specifications define each cloth by weight and breaking strength, both of which are shown in the titles of the detail specifications.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 168 General Techniques of Infrared Quantitative Analysis

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2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

PPP-P-1133 Packaging of Synthetic Fiber Fabrics

FED-STD-191 Textile Test Methods

2.3 American National Standard:

Available from American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, Wisconsin 53202.

ANSI/ASQZ 21.4 Sampling Procedures and Tables for Inspection by Attributes

2.4 Other Publications:

Available from Federal Trade Commission, Washington, DC 20580.

Textile Fiber Products Identification Act, Rules and Regulations

3. TECHNICAL REQUIREMENTS:

3.1 Detail Specifications:

Requirements for a specific cloth shall consist of requirements specified herein in addition to requirements specified in the applicable detail specification. In case of conflict between requirements of this specification and an applicable detail specification, requirements of the detail specification shall govern.

3.2 Material:

Cloth shall be woven from an intermediate modulus para-aramid yarn (See 8.3) as shown in Table 1. Yarn shall not carbonize at a temperature lower than 780 °F (416 °C) determined in accordance with FED-STD-191, Method 1534. Attenuated total reflectance infrared analysis methods in accordance with ASTM E 168 shall be used to identify the material.

TABLE 1 - Initial Yarn Modulus

| Yarn Size Denier | Initial Modulus gms/denier $\pm 10\%$ |
|---------------------|--|
| 200 | 740 |
| 400 | 670 |
| 1000 | 605 |
| 1500 | 565 |
| 3000 | 545 |

3.3 Properties:

Shall conform to requirements specified in the applicable detail specifications. Tests shall be performed on the cloth supplied and in accordance with specified test methods.

3.4 Quality:

Cloth, as received by purchaser, shall be clean, evenly woven, and free from foreign materials and from imperfections detrimental to usage of the cloth.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the cloth shall supply all samples and shall be responsible for all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cloth conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Requirements shown in Table 2 are acceptance tests and shall be performed on each lot.

TABLE 2 - Acceptance Tests

| Requirement | Paragraph Reference |
|-------------------------|--------------------------|
| Material Identification | 3.2 |
| Weight | See Detail Specification |
| Breaking Strength | See Detail Specification |
| Quality | 3.4 |

4.2.2 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of cloth by the manufacturer, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 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 and Testing:

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient cloth shall be taken at random from each lot to perform all required tests. 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.

4.3.1.1 A lot shall be all cloth of a single weight and breaking strength produced in a single production run under the same fixed conditions and presented for manufacturer's inspection at one time.

4.3.1.2 The sample unit shall be 4 yards (3.7 m), full width, of the finished cloth. The sample size shall be as shown in Table 3. Lot size shall be expressed in units of 1 yard (0.9 m). The lot shall be unacceptable if one or more sample units fail to meet any specified requirement.

TABLE 3 - Cloth Sampling

| Lot Size Yards | | Lot Size Meters | | Sample Size |
|-------------------|---------------------|--------------------|---------------------|----------------|
| Up to | 800, incl | Up to | 732, incl | 2 |
| Over | 800 to 22,000, incl | Over | 732 to 20,117, incl | 3 |
| Over | 22,000 | Over | 20,117 | 5 |

4.3.1.3 Yard-by-Yard (Meter-by-Meter) Examination: A sufficient number of rolls shall be selected from a lot so that the required sample length will be obtained by inspecting approximately 25 consecutive yards (23 m) out of each sample roll. The required length of each piece shall be examined on both sides and visual defects classified as listed in Table 4. All defects found shall be counted regardless of their proximity to one another except where two or more defects represent a single local condition of the cloth, in which case, only the more serious defect shall be counted. A continuous defect shall be counted as one defect for each warp-wise yard (0.9 m) or fraction thereof in which it occurs. The lot size for this examination shall be 1 linear yard (0.9 linear m). The sample size shall be in accordance with ANSI/ASQZ 21.4, Level 3. The maximum level of defects per 100 yards (0.9 m) shall be 2.5 for major defects and 10.0 for total defects. The term "clearly noticeable" as referenced in Table 4 shall be interpreted to mean visible at normal inspection distance of approximately 3 feet (914 mm).

TABLE 4 - Classification of Defects

| Defect | Description | Major | Minor |
|---|---|-------|-------|
| Abrasion marks | Any abrasion mark showing fuzziness. | X | |
| Biased filling | Over 2 inches (51 mm) from horizontal at the greatest point of bias. | X | |
| Bowed filling | Over 2 inches (51 mm) in height, measured from a straight line chord to the highest point of arc. | X | |
| Break, cut, hole, or tear (other than pinhole, etc) | Three or more warp or filling threads ruptured at adjoining points. | X | |
| Filling bar variations | Over 0.125 inch (3.18 mm) and 0.5 inch (13 mm) and under in width with 10% or less variation above normal pick count. | | X |
| | Over 0.125 inch (3.18 mm) and 0.5 inch (13 mm) and under in width with more than 10% variation below normal pick count. | X | |
| | Over 0.5 inch (13 mm) in width with more than 10% variation from normal pick count. | X | |
| | 0.125 inch (3.18 mm) and under in width and varying 10% or more from normal pick count. | | X |
| Floats or skips | Any multiple float 3/16 inch (4.8 mm) square or over. | X | |
| | Single floats 1/4 inch (6.4 mm) or over in length. | X | |
| | Contiguous pin floats, the sequence of which measures 1 inch (25 mm) or over in length. | | X |
| | Multiple floats under 3/16 inch (4.8 mm) square. | | X |
| | Single floats under 0.25 inch (6.4 mm) in length. | | X |
| | Contiguous floats or pin floats, the sequence of which measures under 1 inch (25 mm) in length (See 8.2). | X | |
| Jerked-in filling | Any jerked-in filling occurring more than four times within 10 linear inches (254 linear mm). | | X |

TABLE 4 - (Continued)

| Defects | Description | Major | Minor |
|---|--|-------|-------|
| Loops, kinks, or snarls (except selvage) | All over 0.125 inch (3.18 mm) in length. | X | |
| | Three, or more, in any 1 linear yard (0.9 linear m); 0.125 inch (3.18 mm) and under in length. | X | |
| | Up to 2 inches (51 mm) in any 1 linear yard (0.9 linear m); 0.125 inch (3.18 mm) and under in length. | | X |
| Mispick | Three, or more, picks in a shed. | X | |
| | Double or 2 picks. | | X |
| Missing end | Two or more contiguous regardless of length. | | |
| | Single 36 inches (914 mm) and over in length. | X | |
| | Single under 36 inches (914 mm) in length. | | X |
| Missing pick | Two or more contiguous regardless of length. | X | |
| | One missing pick, full width. | | X |
| | Continuous stringy or loopy selvage projecting under 0.125 inch (3.18 mm). | | X |
| Selvage defects | Any cut, broken, torn, scalloped, or clearly noted waviness along the selvage edge (check for waviness under no tension). | X | |
| | Over 3 inches (76 mm) of continuous stringy or loopy selvage projecting 0.125 inch (3.18 mm) or over. | X | |
| | Any clearly noticeable roll of edge or edges when the tension is released (tight selvage). | X | |
| Slubs, strip-back, etc | Any abruptly thickened place in the fabric caused by extraneous material woven in the fabric or a strip-back continuing over 1.5 inches (38 mm) in length and being more than 1/16 inch (1.6 mm) wide for that length. | X | |
| | Slubs 1.5 inches (38 mm) and under in length or 1/16 inch (1.6 mm) and under in width. | | X |
| Smash | Any smash. | X | |
| Weave | Pattern other than specified. | X | |

TABLE 4 - (Continued)

| Defects | Description | Major | Minor |
|-----------------------------------|---|-------|-------|
| Weaver's stain | Any spot, stain, or streak (not dye streaks) of the following magnitudes: | | |
| | Single ends or picks 15 inches (381 mm) or over in length. | X | |
| | Double ends or picks 8 inches (203 mm) or over in length. | X | |
| | More than two ends or picks 5 inches (127 mm) or over in length or a clearly noticeable area over 0.25 inch (6.4 mm) in area, whichever is greater. | X | |
| | Single ends or picks 2.5 to 15 inches (64 to 381 mm) in length. | | X |
| | Double ends or picks 2.5 to 8 inches (64 to 203 mm) in length. | | X |
| | Over two ends or picks under 5 inches (127 mm) in length or a clearly noticeable area 0.25 square inch (161 mm ²) or under in area, whichever is greater. | | X |
| Width | Less than the specified width. | X | |
| Wrong draw | Clearly noticeable warpwise streak over 18 inches (457 mm) in length. | X | |
| Yarn deformations (Types 1 and 2) | Over six yarn deformations or shifts of 1/32 inch (0.8 mm) or more over 6 inches (152 mm) in length occurring within an area equal to a 6 inch (152 mm) diameter circle. | X | |
| | 3 to 6 yard (2.7 to 5.5 m) deformations of 1/32 inch (0.8 mm) or more over 6 inches (152 mm) in length occurring within an area equal to a 6 inch (152 mm) diameter circle. | | X |

4.3.1.4 Overall Examination: The unit of cloth for overall examination shall be one piece. Each piece shall be examined for the following defects. If any one piece contains any of the defects, the lot represented shall be rejected.

Objectionable odor

Uncleanliness throughout

Uneven weaving throughout

Not labeled in accordance with Textile Fiber Products Identification Act

4.3.1.5 Examination for Length:

4.3.1.5.1 Individual Rolls: Any roll length found to be less than specified, or more than 2 yards (1.8 m) below the length marked on the ticket, shall be considered a defect with respect to length. The lot shall be unacceptable if two or more rolls in the sample are defective with respect to length.

4.3.1.5.2 Total Length: The lot shall be unacceptable if the total of the actual lengths of the roll examined is less than the total of the lengths marked on the ticket.

4.3.1.6 A statistical sampling plan, acceptable to purchaser, may be used in lieu of sampling as in 4.3.1.

4.3.2 For Preproduction Tests: Acceptable to purchaser.

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 Manufacturer shall use the same ingredients and processing procedures as was used for the preproduction cloth. If any changes are required the manufacturer shall submit a statement of the proposed changes, and, if requested, a sample cloth using proposed changes. No production cloth shall be shipped before the changes are approved.

4.5 Test Methods:

Shall be in accordance with the following; manufacturer's certificate of compliance is acceptable for material, denier, and twist.

4.5.1 Air Permeability: The test specimen shall be 7 inches (178 mm) long and full width of the cloth. Individual readings shall be equally spaced across the width (between selvages) of the test specimen, except that no readings shall be taken within an area from the selvage equal to 10% of the specimen width.

4.5.1.1 The air permeability of the test specimen shall be the arithmetic mean of five individual readings.

4.6 Reports:

4.6.1 The supplier of cloth shall furnish with each shipment a report from the manufacturer showing the results of tests to determine conformance to the acceptance tests and stating that the cloth conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3909A and the applicable detail specification number and revision letter, manufacturer's identification, weight, and quantity.