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# AEROSPACE MATERIAL SPECIFICATION

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Superseding AMS-I-7171

## Insulation Blanket, Thermal-Acoustical

FSC 5640

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

STABILIZED NOTICE

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NOTICE

This document has been taken directly from U.S. Military Specification MIL-I-7171D and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-I-7171D. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

1. SCOPE:

1.1 Scope:

This specification covers the requirements of composite blankets suitable for acoustical and thermal insulation of the walls of aircraft compartments within the temperature range of -65°F to +175°F (-54°C to +80°C).

1.2 Classification:

Insulation blankets are furnished in the following types, classes, and styles, as specified (see 6.2b):

1.2.1 Type:

Type I - Quilted blanket
Type II - Cemented blanket

1.2.2 Class:

Class 1 - Semi-stitched blankets
Class 2 - Fully-stitched blankets

1.2.3 Style:

Style A - Non-porous trim cloth
Style B - Porous trim cloth

2. APPLICABLE DOCUMENTS:

The following publications, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 U.S. Government Publications:

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

| | |
|---|---|
| P-D-680 | Dry Cleaning, and Degreasing Solvent |
| V-T-295 | Thread, Nylon |
| QQ-A-250/4 | Aluminum Alloy 2024, Plate and Sheet |
| UU-P-268 | Paper, Kraft, Wrapping |
| PPP-B-576 | Box, Wood, Cleated, Veneer, Paper Overlaid |
| PPP-B-591 | Boxes, Fiberboard, Wood-Cleated |
| PPP-B-601 | Boxes, Wood, Cleated-Plywood |

2.1 (Continued):

| | |
|---|---|
| PPP-B-636 | Box, Shipping, Fiberboard |
| PPP-T-45 | Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing |
| MIL-B-121 | Barrier Material, Greaseproofed, Waterproofed, Flexible |
| MIL-A-3316 | Adhesives, Fire-Resistant, Thermal Insulation |
| MIL-C-8104 | Cloth, Sheeting, Cotton, Treated |
| MIL-L-10547 | Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible |
| MIL-C-22787 | Cloth, Coated, Fuel and Flame Resistant |
| FED-STD-141 | Paint, Varnish, Lacquer, and Related Materials: Methods of Inspection, Sampling, and Testing |
| FED-STD-191 | Textile Test Methods |
| FED-STD-595 | Colors Used in Government Procurement |
| MIL-STD-105 | Sampling Procedures and Tables for Inspection by Attributes |
| MIL-STD-129 | Marking for Shipment and Storage |

2.2 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

| | |
|---|---|
| AMS 3529 | Plastic Sheet and Film, Vinyl Copolymers Unplasticized |
| AMS 4375 | Magnesium Alloy Sheet and Plate 3.-Al-1.02 (AZ31B-0) |

2.3 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

| | |
|---|---|
| ASTM C 800 | Standard Specification for Glass Fiber Blanket Insulation (Aircraft Types) |
| ASTM D 1748 | Standard Test Method for Rust Protection by Metal Preservatives in the Humidity Cabinet |

2.4 Uniform Classification Committee, Agent:

Available from the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.

Uniform Freight Classification Rules

2.5 Order of precedence:

In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS:

3.1 Materials:

The insulation blanket shall be made from the following component materials:

3.1.1 Trim cloth:

3.1.1.1 Non-Porous (Style A): The non-porous cloth shall conform to either Type I or Type II of MIL-C-22787.

3.1.1.2 Porous (Style B): The porous cloth shall conform to MIL-C-8104 or Type III of MIL-C-22787.

3.1.2 Insulation batting: Unless otherwise specified, the insulation batting shall conform to the Type I, 0.60 lbs/ft$^3$ nominal density, water repellent glass fiber blanket of ASTM C 800-89.

3.1.3 Impervious membrane: The impervious membrane shall be either unsupported or supported as follows:

3.1.3.1 Unsupported: The unsupported membrane film shall be a minimum 0.003 inch thick and shall conform to the requirements of AMS 3529.

3.1.3.2 Supported: The supported membrane film shall consist of the cloth backing from 3.1.6 supported in a heat sealable polyethylene terephthalate, or equivalent, film system.

3.1.4 Adhesive: The adhesive used in the cementing operations shall conform to Type I or Type II of MIL-A-3316.

3.1.5 Thread: The thread shall be nylon conforming to Type I, Size A of V-T-295.

3.1.6 Cloth backing: The backing of the insulation blanket shall be a close woven synthetic or fibrous glass fabric and the physical properties shall be as specified in Table I.

3.2 Construction:

The blanket construction shall be Style A conforming to Figure 1, or Style B conforming to Figure 2, and the following types and classes, as specified (see 6.2b).

3.2.1 Quilted blankets, Type I: The quilted blankets shall conform to the pattern shown in Figure 3, and shall be semi-stitched (Class 1) or fully-stitched (Class 2) as specified, (see 6.2b). There shall be approximately 5 stitches to the inch. The stitching shall not compress the blanket such that acoustic and thermal properties are affected.

TABLE I. Physical properties of cloth backing.

| Characteristic | FED-STD-191 Method No. | Requirements |
|---|---|---|
| Weight, ounce per square yard, min | 5041 | 2.0 |
| Breaking strength, grab, pounds, min | 5100 | |
| Warp | | 8.0 |
| Fill | | 8.0 |

3.2.1.1 Semi-stitched blankets (Class 1): All components except the impervious membrane shall be penetrated by the quilting stitches. The impervious membrane designated in Figures 1 and 2 shall be bonded to the cloth backing of the quilted assembly with a thin continuous film of adhesive conforming to Type I or Type II of MIL-A-3316. The supported impervious membrane shall be heat sealed to the quilted assembly, as specified by the manufacturer.

3.2.1.2 Fully-stitched blankets (Class 2): The quilting stitches shall penetrate all components of the blanket.

3.2.2 Cemented blankets, Type II: The mating surface of the various components, except for that of the porous trim cloth and the insulating batting, shall be bonded with a thin, continuous film of adhesive. The porous trim cloth shall be bonded to the batting in evenly distributed spots, the aggregate area of which shall not exceed 10 percent of the area of the blanket.

3.2.3 Binding: The edges of cemented blankets, furnished cut to specific lengths, shall be bound with the trim cloth to provide strength and stability to the blanket section.

3.3 Shrinkage:

The blanket shall not shrink during service to the extent that either the acoustic and thermal properties or the installation and removal shall be affected.

3.4 Color:

Unless otherwise specified the gloss of the trim cloth shall be nonspecular and shall be furnished in one of four colors: Color numbers 34424, 36440, 36231, or 34516 conforming to FED-STD-595 (see 6.2.d).

3.5 Stability:

The blankets shall not visibly change in form, thickness or properties during handling and installation.

3.6 Width:

Unless otherwise specified (see 6.2e), the width of the assembled blankets shall be 36 ± 0.5 inches.

3.7 Thickness:

Blanket thickness shall be uniform (within the tolerance) for the type specified in the contract (see 6.2b).

3.7.1 Type I: The thickness of the quilted blanket shall be the nominal thickness specified +0.10, -0.0 inch, when measured as specified in 4.5.1.5 (see 6.2.f).

3.7.2 Type II: The thickness of the cemented blanket shall be the nominal thickness specified ± 25 percent, when measured as specified in 4.5.1.5 (see 6.2.f).

3.8 Toxicity:

Component materials used shall be of the type which do not emit toxic or noxious vapors in concentrations that will hinder the efficiency or comfort of the aircraft occupants. The material shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate department medical service who will act as an advisor to the procuring agency.

3.9 Sound attenuation:

The sound attenuation properties of the blankets shall be as specified by the acquisition activity (see 6.2i).

3.10 Thermal Properties:

The thermal insulating properties of the blankets shall be as specified by the acquisition activity (see 6.2j).

3.11 Corrosion:

The component materials of the blanket shall neither promote corrosion of any aircraft material which it contacts nor emit corrosive vapors which will damage any portion of the aircraft.

3.12 Fire resistance:

The assembled blankets shall be fire resistant to the extent that if ignited the blanket shall not support combustion.

3.13 Vibration disintegration resistance:

The blankets shall develop or exhibit no appreciable packing, disintegration, or imperfections affecting the serviceability or appearance when subjected to the Vibration Test described in 4.5.2.5. The loss in weight of material during the testing shall not exceed 0.5 percent.

3.14 Workmanship:

All details of manufacture, including the component materials used and the processing of the blankets, shall be in accordance with high-grade commercial practice. The occurrence of defects in the blankets shall not exceed the quality levels specified herein.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance: All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections:

The inspection requirements specified herein are classified as follows:

a. Quality conformance inspection (4.3).

4.3 Quality conformance inspection:

Quality conformance inspection shall consist of all examinations and tests specified herein (see 6.3).

4.3.1 Inspection lot: An inspection lot shall consist of the total length, in yards, of one type, class and style made under essentially the same conditions and offered for delivery at one time. The sample unit for inspections shall be one yard.

4.3.2 Sampling:

4.3.2.1 Sampling for yard-by-yard inspection: The sample size for this inspection shall be determined in accordance with MIL-STD-105, Inspection Level II. A sufficient number of rolls shall be selected at random from each lot so that the required sample yardage will be obtained by examining approximately 25 consecutive yards of each roll. The AQL shall be 1.5 major defects and 4.0 minor defects per 100 units.

4.3.2.2 Dimensional inspection: The sample size for this inspection shall be the number of rolls selected for yard-by-yard inspection of 4.3.2.1. The samples shall be examined as specified in 4.5.1.6. A lot shall be considered unacceptable if either:

a. The total of the actual gross lengths of the pieces in the sample is less than the total of the gross lengths marked on the piece tickets.

b. The width of the blanket is not within the tolerance specified in 3.6, or in the contract (6.2e).

4.3.2.3 Sampling for overall inspection: The sample size for this inspection shall be an appropriate piece of blanket material, taken from each of the sample rolls selected in 4.3.2.1. The samples shall be inspected as specified in 4.5.1.3.

4.3.2.4 Sample for tests: The unit of product shall be two yards. The sample size shall be selected at random from the lot in accordance with the following:

| LOT SIZE (YARDS) | SAMPLE SIZE (UNITS) |
|---|---|
| 800 or less | 2 |
| 801 to 22,000 | 3 |
| Over 22,000 | 5 |

The lot shall be unacceptable if any unit fails to meet any of the tests specified under 4.5.2.

4.3.2.5 Packaging: A quantity of shipping containers prepared for delivery, just prior to closure, shall be selected in accordance with Inspection Level I of MIL-STD-105. The lot size for purposes of this inspection shall be the number of shipping containers. In addition, shipping containers fully prepared for delivery shall be examined for closure defects. The samples shall be inspected as specified in 4.5.1.7.

4.4 Inspection condition:

Samples shall be conditioned at ambient conditions for at least 24 hours before testing. Unless otherwise specified, the physical properties specified in Section 3 apply to the average of the determinations made on a unit of the product.

4.5 Inspection methods:

4.5.1 Visual inspection and dimensional check:

4.5.1.1 In-process material inspection and tests: The in-process inspection and tests will be made at any point or any phase of the manufacturing process to determine whether the materials, construction, and workmanship are as specified in Section 3.

4.5.1.2 Yard-by-yard examination: Samples selected in accordance with 4.3.2.1 shall be examined for the defects identified and classified in Table II. The defects found shall be counted regardless of their proximity to each other except where two or more defects represent a single local condition of the blanket, in which case only the more serious defects shall be counted. A continuous defect shall be counted as one defect for each lengthwise yard or fraction thereof in which it occurs.

4.5.1.3 Overall inspection: Samples selected in accordance with 4.3.2.2 shall be examined for defects as listed in Table III. Each defect shall be counted no more than once in each piece examined.

4.5.1.4 Color: The color of the trim cloth shall be compared with the standard color chip specified in 3.4 and 6.2d in accordance with Method 4250 of FED-STD-141.

4.5.1.5 Thickness: To determine the thickness of the blanket, three thicknesses of material, each slightly less than one foot square, shall be piled on a flat surface and covered by an aluminum-alloy sheet 0.032 inch thick, having an area of one square foot. The distance between the flat surface and the aluminum cover sheet shall be measured at three or more points along each edge, and the average thickness of the blankets computed.



TABLE II. Classification of defects.

| Defect | Major | Minor |
|---|---|---|
| Cut, hole or tear - any | X | |
| Edge cut, torn, broken - extending into body of blanket | X | |
| Crease or wrinkle - hard embedded | | X |
| Spots, stains, streaks - clearly visible | | X |
| Faulty adhesion, Heat sealing - applicable components separating | X | |
| Faulty stitching | X | |
| Any required component or part missing | X | |
| Assembly not constructed as specified | X | |

TABLE III. Classification of defects for finished blankets.

| Examine | Defect |
|---|---|
| Finished Blanket | Objectionable odor (see 3.8).<br><br>Uncleanliness throughout.<br>Color off-shade - not within established tolerance.<br><br>Edge curled, folded, rolled, slack or loopy, over more than half the piece 1/.<br><br>Thickness not uniform.<br><br>Stability faulty. |

1/ Intermittently or continuously.

4.5.1.6 Dimensional examination: Samples selected in 4.3.2.2 shall be measured for conformance to width and length requirements in accordance with Methods 5020 and 5010 of FED-STD-191. A dimensional defect shall be defined as either:

a. Any gross length of a roll less than the minimum roll length specified in the contract (see 6.2g).

b. Any gross length of a piece less than the minimum piece length specified in the contract (see 6.2g).

c. Any gross length of a piece less than the gross length marked on the piece ticket by 2 yards or more.

4.5.1.7 Packaging: The shipping containers selected shall be examined for conformance to the requirements of Section 5 of this specification and Table IV. There shall be no defects.

TABLE IV. Examination of packaging.

| Examine | Defect |
|---|---|
| Packaging | Not level specified.<br>Rolls not properly wound or secured.<br>Wrapping omitted, damaged, missing or not taped. |
| Packing | Not level specified; container not in accordance with contract requirements.<br>Any nonconforming component; components missing, damaged.<br>Incomplete closure of case liner, container flaps, loose strappings.<br>Bulged or distorted containers. |
| Weight | Gross weight exceeds requirement. |
| Count | Less than specified or indicated quantity per container. |
| Markings | Interior or exterior markings omitted, illegible, incorrect, incomplete or not in accordance with contract requirements.<br><br>Special markings omitted or incorrect. |



4.5.2 Tests:

4.5.2.1 Fire resistance test: Samples of the assembled blanket shall be tested for fire resistance in accordance with FED-STD-191 Method 5903. The blanket shall not support a flame after the burner is removed.

4.5.2.2 Corrosion.

4.5.2.3 Preparation of test panels: Two sets of panels of polished aluminum and polished magnesium shall be prepared. Aluminum panels shall conform to QQ-A-250/4 and magnesium panels shall conform to AMS 4375-84. Panels shall be 2 by 4 inches in width and length, respectively, and from 0.063 to 0.125 inch in thickness. Edges shall be rounded and two 0.125 inch diameter holes drilled at opposite corners of the 4 inch side. Panels shall be finished with 280-grit abrasive. Immediately prior to use, panels shall be cleaned by successive washings in solvent conforming to P-D-680 followed by boiling 95 percent methanol, and finally in boiling absolute methanol. An equal size specimen of the assembled blanket to be tested shall be attached to the panel by means of clips which will not cause or be susceptible to corrosion. The other panels shall be placed in the cabinet for comparison.

4.5.2.4 Procedure: The panels shall be suspended from 18-8 stainless steel or monel metal hooks in a humidity cabinet conforming to and operated in accordance with ASTM D 1748-83. The exposure period shall be seven days at 95 percent relative humidity and 120° ± 2°F. There shall be no difference between the type or extent of corrosion of the test sample and the sample for comparison.

4.5.2.5 Vibration disintegration resistance: A specimen at least 20 inches long and 12 inches wide shall be mounted with the long side vertically clamped in such a fashion that the top and bottom shall be open and the entire panel shall be free to vibrate horizontally. The specimen shall be vibrated horizontally for 12 hours through a double amplitude of at least 0.04 inch at a frequency of 1500 cycles per minute. Before the test is begun, the specimen shall be carefully weighed, and after completion of the vibration test, the specimen shall be weighed again and examined for evidence of packing, disintegration and other imperfections.

5. PACKAGING:

5.1 Cleaning, preservation and packaging:

Cleaning preservation and packaging shall be level A or C as specified (see 6.2k).

5.1.1 Level A.

5.1.2 Unit Packaging: The amount of material and permissible number of lengths in each roll, shall be as specified by the acquisition activity (see 6.2g and 6.2h). Each roll shall be secured to prevent unwinding, loosening, or slippage during handling, shipping, and storage. The material shall be rolled on a heavy spiral fiber tube having an inside diameter of not less than 1 inch. The ends of the tube shall project not more than 0.75 inch beyond the ends of the material. The entire roll shall be wrapped with Kraft paper conforming to UU-P-268 Grade B basis weight 60 pounds and then overwrapped in waterproof barrier material conforming to MIL-B-121. Ends of the roll shall be completely covered. The wrapping shall be sealed with tape conforming to PPP-T-45.

5.1.3 Level C: The blanket material shall be packaged to afford the minimum degree of protection necessary to prevent deterioration or damage during shipment under normal environmental conditions and commercial modes of transportation.

5.2 Packing:

Packing be level A, B, or C as specified (see 6.2k).

5.2.1 Level A: The blanket material packaged as described in paragraph 5.1 shall be packed in overseas type exterior containers conforming to PPP-B-591, PPP-B-601, PPP-B-636, or PPP-B-576. Strapping and closures shall be in accordance with the appendix of the applicable container specification. Fiberboard containers shall not exceed the weight and dimension limits of the applicable container specification. The gross weight limit of wood and wood cleated containers shall not exceed 200 pounds. Exterior shipping containers shall be provided with a sealed waterproof case liner conforming to MIL-L-10547, and the appendix thereto.