

MIL-I-22023D
 18 August 1982
 SUPERSEDING
 MIL-I-22023C
 10 May 1968
 (See 6.5)

MILITARY SPECIFICATION

INSULATION FELT, THERMAL AND SOUND ABSORBING FELT, FIBROUS GLASS, FLEXIBLE

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers lightweight, faced and unfaced flexible fibrous glass felt for thermal and sound absorbing insulation for use in temperatures up to 204 degrees Celsius ($^{\circ}\text{C}$) (400 degrees Fahrenheit ($^{\circ}\text{F}$)).

1.2 Classification. The fibrous glass felt insulation shall be of the following types and classes as specified (see 6.2.1). The classes are differentiated according to nominal densities (see table I).

TABLE I. Nominal density.

Types	kg/m ³	lb/ft ³
Type I: Unfaced, thermal felt		
Class 2	12	.75
Class 3	16	1.0
Class 4	24	1.5
Class 5	32	2.0
Class 6	48	3.0
Type II: Unfaced, sound absorbing felt		
Class 2	12	.75
Class 3	16	1.0
Class 4	24	1.5
Class 5	32	2.0
Class 6	48	3.0
Type III: Faced, thermal and sound absorbing felt	45	2.8

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

- TT-P-98 - Paint: Stegcil, Flat.
- PPP-B-636 - Boxes. Shipping, Fiberboard.

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- MIL-I-742 - Insulation, Board, Thermal, Fibrous Glass.
- MIL-Y-1140 - Yarn, Cord, Sleeving, Cloth and Tape - Glass.
- MIL-A-3316 - Adhesives, Fire-Resistant, Thermal Insulation.
- MIL-E-17970 - Enamel, Nonflaming (Dry), Chlorinated Alkyd Resin, Soft White, Semigloss, Formula 124/58.
- MIL-C-20079 - Cloth, Glass; Tape, Textile, Glass; and Thread Glass.

STANDARDS

FEDERAL

- FED-STD-313 - Material Safety Data Sheets, Preparation and the Submission of.

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-1623 - Fire Performance Requirements and Approved Specifications for Interior Finish Materials and Furnishings (Naval Shipboard Use).

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC. AGENT
National Motor Freight Classification

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., ATA TRAFFIC Dept., 1616 "P" Street, NW, Washington, DC 20036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- C 165 - Measuring Compressive Properties of Thermal Insulations.
- C 167 - Thickness and Density of Blanket or Batt-Type Thermal Insulating Materials.
- C 177 - Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate. (DoD adopted)
- C 203 - Breaking Load and Calculated Flexural Strength of Preformed Block-Type Thermal Insulation.
- C 423 - Sound Absorption and Sound Absorption Coefficient by the Reverberation Room Method.
- D 1448 - Micronaire Reading of Cotton Fibers.
- E 70 - pH of Aqueous Solutions with the Glass Electrode. (DoD adopted)
- E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

UNIFORM CLASSIFICATION COMMITTEE AGENT
Uniform Freight Classification Ratings, Rules and Regulations.

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 First article inspection. When specified, the contractor shall furnish sample units for first article inspection and approval (see 4.2, 6.2.1, 6.3, and 6.3.1).

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3.2 Material. Type I and II materials shall be glass, processed from a molten state into a fibrous form, bonded with a binder to form a flexible felt. Type III materials shall be fibrous glass board bonded with glass yarns (see MIL-Y-1140) laminated to a polyester film. If an adhesive is used it shall conform to the requirements of MIL-A-3316. Asbestos fibers and components containing asbestos fibers are prohibited. A certificate of compliance shall be required that the material is asbestos free in accordance with the data ordering document (see 6.2.2).

3.2.1 Recovered materials. Unless otherwise specified herein, all material, incorporated in the insulation felt covered by this specification shall be new and shall be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.2.2 Fiber diameter. The average fiber diameter shall not exceed 1.5×10^{-4} centimeters (cm) (0.00038 inch) (see 4.5.1).

3.2.3 Nonfibrous material (shot) content. The nonfibrous material (shot) content (types I, II, and type III exclusive of facing) shall be not greater than 1.5 percent by mass when tested as specified in 4.5.2.

3.2.4 Tape. Fibrous glass tape covering the butted joints of the board shall conform to type II, class 1 of MIL-C-20079.

3.2.4.1 Adhesive bond strength (type III). Adhesive bond strength for tape shall conform to the requirements of class 1, grade A of MIL-A-3316. Adhesive bond strength shall not be less than 3 pounds when tested as specified in 4.5.3.

3.3 Dimensions and densities.

3.3.1 Dimensions.

3.3.1.1 Length of rolls (types I, II, and III). Thicknesses greater than 25 millimeters (mm) (1 inch) and all class 6 materials may be furnished either in flexible blanket or cut sheets unless specified (see 6.2.1).

3.3.1.1.1 Continuous. Felt shall be furnished in rolls with minimum lengths as specified in table IA and requested in 6.2.1.

TABLE IA. Length of rolls (all types).

Dimension	
Meters	Feet
15	50
31	100
61	200

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3.3.1.1.2 Cut sheets. Rolls may contain more than one piece with minimum lengths as specified in table IB and requested in 6.2.1.

TABLE IB. Length of cut pieces.

Types	Dimension			
	Meters	Feet	Millimeters	Inches
I and II	3	10		
III			910 1220	36 48

3.3.1.2 Width. The width of the rolls shall be in accordance with table II (see 3.3.1.4, 4.5.4.2, and 6.2.1).

TABLE II. Width of rolls.

Types	Dimension	
	Millimeters	Inches
I and II	610 910 1220 1830	24 36 48 72
III	610	24

3.3.1.3 Thickness. The felt shall be furnished in accordance with table III (see 3.3.1.4, 4.5.4.3 and 6.2.1).

TABLE III. Thickness of felt.

Types	Dimension	
	Millimeters	Inches
I and II	13 25 38 51 64 76 89 102	.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
III	19 25 38 51	.75 1.0 1.5 2.0

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3.3.1.4 Tolerances. Tolerances on length, width, and thicknesses shall not exceed plus or minus 3 mm (1/8 inch) from the values shown in tables I, II, and III.

3.3.1.5 Facing alinement. In case the facing material does not cover the entire surface of the board, the uncovered portion of the board shall not extend back further than 3 mm (1/8 inch) from any edge. The facing shall not extend over the edge of the board more than 3 mm (1/8 inch) except as noted in 3.3.1.5.1 (see 4.5.4.4).

3.3.1.5.1 Special wraparound facing. Special order faced panels may be required in accordance with 6.2.1. This type of special facing may extend over the edge of the panel more than 3 mm, according to the specific order.

3.3.1.6 Paintability. The faced board, as furnished, shall be compatible with and shall hold one coat of paint in accordance with MIL-E-17970, after one coat of Latex Emulsion flat primer (Ocean Chemicals, Inc. No. 634, or equal) has been applied to the type III facing (see 4.5.5).

3.3.2 Density. The insulation felt shall conform to the following densities within a plus or minus tolerance of 10 percent (see table IV and 4.5.6).

TABLE IV. Density.

Types I and II	kg/m ³	lb/ft ³
Class 2 -----	12	0.75
3 -----	16	1.0
4 -----	24	1.5
5 -----	32	2.0
6 -----	48	3.0
Type III -----	45	2.8

3.3 Kerfing. Type III panels shall be capable of being kerfed with a 90 degree V-groove to facilitate bending when the panel is folded to a right angle. The facing material shall be flexible to form a neat square corner at the kerfed joint (see 4.5.7).

3.4 Binder content. Type I and II binder content shall not exceed 30 percent by weight (see 4.5.8).

3.5 Alkalinity and pH. The alkalinity of the felt expressed as equivalent sodium oxide (Na₂O) shall be not greater than 0.60 percent when tested as specified in 4.5.9. The pH shall be not less than 7.5 nor more than 12.0 when measured as specified in ASTM E 70 (see 4.5.9).

3.6 Flexibility. The felt shall show no visible rupture or cracking on the outside surface and shall spring back to the original shape and dimensions when tested as specified in 4.5.10 for types I and II. Type III shall meet the compression requirements of 3.6.1.

3.6.1 Compression for type III. The unit load required to compress the board to 40 percent of its original thickness shall average not less than 1246 Newton per square meter (N/m^2) (255 pounds per square foot (lb/ft^2)) (see 4.5.11). Upon completion of the test, the board, after a 5-minute interval, shall return to at least 70 percent of its original thickness.

3.7 Fire resistance. Type I and II materials shall have a flame spread rate less than 25 and smoke development of less than 50 when tested as specified in 4.5.12. Type III materials shall be tested in accordance with the method in appendix A. Flashover time shall be greater than 10 minutes.

3.8 Thermal conductivity (type I and III). The thermal conductivity (k) of type I felt shall not exceed the values shown in table V (see 4.5.13). type III material shall conform to the thermal requirements of MIL-I-742.

TABLE V. Maximum thermal conductivities (type I).

Class	Maximum thermal conductivity (k) at mean temperatures				
	4°C (25°F)	10°C (50°F)	24°C (75°F)	38°C (100°F)	94°C (20°F)
	(k) = Watt per meter degree Kelvin (BTU - inch per hour square feet °F)				
2	0.26	0.28	0.30	0.32	0.43
3	0.24	0.26	0.28	0.30	0.39
4	0.23	0.24	0.26	0.28	0.35
5	0.22	0.23	0.24	0.25	0.31
6	0.21	0.22	0.23	0.24	0.30

3.9 Vibration resistance (type II). There shall be not more than a 0.50 percent mass loss of the material and no sagging or settling of type II felt when subjected to the vibration test specified in 4.5.14 through 4.5.14.2.

3.10 Sound absorption coefficients (type II). The coefficients of absorption for types II and III felt shall be not less than the values shown in table VI (see 4.5.15).

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TABLE VI. Coefficients of sound absorption (types II and III).

Nominal thickness of felt			Frequency, Hz						
Types	Dimensions		125	250	500	1000	2000	4000	NRC
	mm	inches							
II	13	.5	0.04	0.10	0.20	0.40	0.55	0.55	0.31
	25	1.0	.06	.20	.45	.65	.65	.65	.49
	51	2.0	.15	.40	.75	.75	.75	.70	.66
	76	3.0	.20	.60	.90	.80	.80	.75	.77
	102	4.0	.25	.65	.95	.85	.85	.80	.82
III	51	2.0	.43	.96	1.0	.70	.51	.35	.80

3.11 Material safety data sheet. The contracting activity shall be provided a material safety data sheet (MSDS) at the time of contract award. The MSDS is form OSHA-20 and is part of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification.

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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in section 4.5.

4.2 First article inspection. First article inspection shall consist of the first article examination and tests shown in table VII.

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TABLE VII. First article examination and tests.

Inspections/characteristics	Requirements	Tests
Fiber diameter	3.2.2	4.5.1
Nonfibrous material (shot) content	3.2.3	4.5.2
Adhesive bond strength of tape	3.2.4.1	4.5.3
Length	3.3.1.1	4.5.4.1
Width	3.3.1.2	4.5.4.2
Thickness	3.3.1.3	4.5.4.3
Facing alinement	3.3.1.5	4.5.4.4
Paintability	3.3.1.6	4.5.5
Density	3.3.2	4.5.6
Kerfing	3.3	4.5.7
Binder content	3.4	4.5.8
Alkalinity and pH	3.5	4.5.9
Flexibility	3.6	4.5.10
Compression	3.6.1	4.5.11
Fire resistance	3.7	4.5.12
Thermal conductivity	3.8	4.5.13
Vibration resistance	3.9	4.5.14
Sound absorption	3.10	4.5.15

4.3 Sampling.

4.3.1 Lot. For purposes of sampling, a lot shall consist of all felt of the same type, class, thickness, and width produced in one plant under essentially the same conditions and offered for delivery at the same time.

4.3.2 Sampling for test. Samples shall be selected from each lot at random for the tests specified in 4.3.4. The total quantity of felt in square feet shall be the lot size and the number of test specimens shall be in accordance with MIL-STD-105 at inspection level S-1.

4.3.3 Fire resistance specimen. For types I and II, a sample 57 cm (20 inches) wide by 7 meters (24 feet) long shall be tested in conformance with ASTM E 84. Sample set for type III materials shall be as follows: 1 piece 30 by 78 inches by 1 inch to line the front, back and ceiling of the box; and 2 pieces 30 by 24 inches by 1 inch to line the sides of the box. A minimum of three sample sets shall be tested and the average shall conform to the requirements of 3.7.

4.3.4 Tests. The samples selected in accordance with 4.3.2 shall be subjected to the tests specified in 4.5 to determine conformance with this specification. If the number of samples tested exceeds the Acceptance Quality Level (AQL) stated in 4.3.2, this shall be cause for rejection of the entire lot.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the examination specified in 4.4.1.

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4.4.1 Sampling for visual and dimensional examination. A random sample of rolls or sheets shall be selected from each lot offered for inspection in accordance with MIL-STD-105 at inspection level II. The AQL shall be 2.5 percent defective for types I and II. Type III AQL shall be 6.5 percent defective.

4.4.2 Rejection. Any roll or sheet containing one or more visual, dimensional, or density defects shall not be offered for delivery, and if the number of the defective rolls or sheets in any sample exceeds the acceptance number for that sample, this shall be cause for rejection of the lot represented by the sample.

4.5 Test procedures.

4.5.1 Fiber diameter. The diameter of the fiber shall be determined by one of the following methods:

- (a) Microscopic. Diameter of the fiber shall be determined microscopically on the basis of measuring 50 fibers on each of the samples selected on a per lot basis (see 4.3.1). The average diameter for purposes of determining conformance with 3.2.2 shall be the average of all measurements on all samples.
- (b) Air flow. The air flow method as measured by the Micronaire instrument in accordance with ASTM D 1448.

4.5.2 Nonfibrous material (shot) content. For types I, II and III exclusive of facing, the nonfibrous material (shot) content of 10 grams (g) of each sample shall be determined by finely separating or breaking it up by means of a piece of soft rubber against a coarse screen directly into a nest of two U.S. Standard sieves, Nos. 30 and 50, and a receiving pan. A soft brush or other means, at the discretion of the operator, may be used to facilitate sieving. Long fibers may be removed by hand or gentle blowing if their horizontal orientation prevents them from passing through. Shake by machine or by hand until essentially all the fiber has been removed from the two sieves. The fine splinters and dust shall be aspirated and the remainder of the material clinging to the Nos. 30 and 50 sieves shall be combined and weighed, divided by the sample mass, and multiplied by 100 to give the shot content in percent. CAUTION: At all stages of this test, avoid any loss of shot which would invalidate the test results.

4.5.3 Adhesive bond strength of tape (type III Butt Joint Seams). Adhesive bond strength shall be determined in accordance with MIL-A-3316, using cement conforming to class 1 of MIL-A-3316, and fibrous glass tape conforming to type II, class 1 of MIL-C-20079. The tape shall be applied to the face surface (see 3.2.4.1).

4.5.4 Dimensions.

4.5.4.1 Length. Length shall be tested by direct measurement (see 3.3.1.1) using a steel rule with 1 mm graduations.

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4.5.4.2 Width. The width shall be tested by direct measurement (see 3.3.1.2) using a steel rule with 1 mm graduations.

4.5.4.3 Thickness. The thickness of each roll or sheet selected in accordance with 4.3.2 shall be determined by the method specified in ASTM C 167. It will not be necessary to cut samples from the rolls or sheets in order to determine the thickness of the rolls or sheets. A 91 x 91 cm (36 x 36 inch) section of each roll or sheet can be ruled off and used as the test specimen (see 3.3.1.3 and 4.3.3).

4.5.4.4 Facing alinement. Face alinement shall be tested by direct measurement (see 3.3.1.5) using a steel rule with 1 mm graduations.

4.5.5 Paintability (type III only). Apply one coat of Latex Emulsion flat primer (Ocean Chemicals, Inc. No. 634, or equal) and one coat of fire retardant paint conforming to MIL-E-17970 to the cloth surface of the type III board. The paint shall dry to a uniform smooth coat which shall have a flat to semi-gloss appearance when viewed under ordinary conditions of illumination. There shall be no shiners or flashes. Tinted colors shall dry to a uniform even color (see 3.3.1.6 and 6.1.2.1).

4.5.6 Density. The density of each roll or sheet selected in accordance with 4.3.2 shall be determined by the method specified in ASTM C 167 in accordance with the requirements of 3.3.2.

4.5.7 Kerfing.

4.5.7.1 Position. The two kerf-cutting knives shall be positioned so that they form an angle of 90 degrees with each other and so that the tip of one knife is approximately 6 mm (1/4 inch) in advance of the tip of the other knife. The knives shall be kept sharp. The knives are to be adjusted to reach just below the facing (see 3.3).

4.5.7.2 Process. Ninety degree V-grooves shall be kerfed in the sample panel. The grooves shall be examined for smoothness of surfaces. The panel shall then be folded, examined and the facing shall also be examined to determine if the corners are neat and square.

4.5.8 Binder content. For types I and II, the binder content of each sample tested shall be determined by heating not less than 39 cm² (6 in²) of the material separated into small sieves to approximately 538°C (1000°F) for one hour in an oven adequately vented in such a manner as to ensure complete circulation of the atmosphere of the entire oven chamber, preferably by fan or other forced circulation methods. The mass before and after heating shall be taken under atmospheric conditions of the same relative humidity. The mass loss will be calculated and examined for compliance with 3.4.

4.5.9 Alkalinity and pH. Tests for alkalinity and pH shall be performed in accordance with the method in ASTM E 70 to determine conformance with the requirements of 3.5.

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4.5.10 Flexibility. Test for flexibility shall be performed in accordance with ASTM C 203 to determine conformance with the requirements of 3.6.

4.5.11 Compression. The compression test shall be performed in accordance with ASTM C 167 to determine conformance with the requirements of 3.6.1.

4.5.12 Fire resistance. Type I and II materials shall be tested in accordance with the tunnel test of ASTM E 84. Fire resistance of type III materials shall be determined in accordance with the criteria and method found in appendix A (see 3.7).

4.5.13 Thermal conductivity. The felt shall be tested in accordance with ASTM C 177 to determine conformance with 3.8.

4.5.14 Vibration resistance.

4.5.14.1 Test procedure. A test specimen 12 inches square shall be subjected to the endurance test for type I of MIL-STD-167-1, except that the total period of the test shall be at least 100 hours at a frequency of 12 hertz with an amplitude of vibration of $3.3 \text{ mm} + .015 \text{ cm}$ ($.13 + .006 \text{ inch}$) only. In preparation for the test, the test specimen shall be blown clean of all loose or cut surface particles and weighed to the nearest 0.1 g. After weighing, the test specimen shall be placed in a tight fitting five-sided sheet metal box covered with a No. 16 mesh wire screen tightly stretched and firmly attached to the box over the open side. The specimen shall be in intimate contact with the screen and five sides of the box. The method of attachment shall be in accordance with MIL-STD-167-1, allowing the test specimen to have the exposed face down and in a horizontal position. A pan shall be installed below the test specimen to catch all material/particles that fall from the test specimen during the test. The test shall be conducted with the specimen in the horizontal position only. The vibration excitation shall be in the horizontal position only.

4.5.14.2 Test results. At the completion of the test, the specimen shall be removed from its mounting attachments and the sheet metal box and again weighed to the nearest 0.1 g. The mass loss of the specimen will be calculated and examined to determine compliance with 3.9. In addition, the type II specimen shall be examined for any sagging or settling to determine compliance with the requirements of 3.9.

4.5.15 Sound absorption coefficients (type II). Sound absorption coefficients of types II and III felt shall be determined by laying felt on the floor of a reverberation room and testing in accordance with ASTM C 423.

4.6 Inspection of packaging. Sample packages and packs and inspection of the packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

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5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisitions. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.4).

5.1 Preservation. Not required.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2.1).

5.2.1 Level A. Insulation felt shall be packed in fiberboard boxes conforming to class weather-resistant of PPP-B-636, except that limitations on inside dimensions of the box shall not apply. Box closure shall conform to method V of the appendix to PPP-B-636.

5.2.2 Level B. Insulation felt shall be packed in fiberboard boxes conforming to class domestic of PPP-B-636, except that limitations on inside dimensions of the box shall not apply. Box closure shall conform to method I of the appendix to PPP-B-636.

5.2.3 Level C. Insulation felt shall be packed in containers, at the lowest rates, in a manner which will ensure acceptance by common carrier and will afford protection against physical damage during direct shipment from the supply source to the first receiving activity for immediate use. This level in general shall conform to the Uniform Freight Classification Rules or other carrier regulations as applicable to the mode of transportation and may be the contractor's commercial practice when such meets the requirements of this level.

5.3 Marking. In addition to any special marking required (see 6.2.1), shipping containers shall be marked for shipment in accordance with MIL-STD-129.

5.3.1 Special marking. The type III insulation panels shall be marked as follows: "ACOUSTIC TREATMENT - DO NOT PAINT." The letters shall be 2.5 cm (1 inch) high, black, in accordance with TT-P-98 and this marking shall be repeated every 120 cm (4 feet) on continuous rolls or at least once on each panel.

6. NOTES

6.1 Intended use. The material covered by this specification is intended to be used as thermal insulation or acoustic treatment or both for ventilation ducts, bulkheads, and overheads aboard ship.

6.1.1 Specified use. In accordance with ship specifications the listed materials are typically used in the following applications:

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Types of material	Shipboard application
I	<ul style="list-style-type: none"> • Thermal lagging of heating, ventilation and air conditioning ducts. • Thermal treatment for compartments.
II	<ul style="list-style-type: none"> • Acoustic lagging and lining of heating ventilation and air conditioning ducts. • Acoustic treatment of compartments.
III	<ul style="list-style-type: none"> • Treatment alternative for type II materials protected by vapor barriers.

6.1.2 Special maintenance. The type III material shall be painted with a maximum of two coats of paint since accumulated layers of paint will adversely effect the sound absorption characteristics. Accordingly, the type III material shall be maintained by washing in lieu of painting.

6.1.2.1 Painting instructions. The faced material shall be primed with one coat of Latex Emulsion flat primer (Ocean Chemicals, Inc. No. 634 or equal) in accordance with manufacturer instructions. The finish coat shall be one coat of fire retardant paint conforming to MIL-E-17970 (see 4.5.5).

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type and class required (see 1.2 and 3.3.2).
- (c) First article sample, when required (see 3.1).
- (d) Length, width, and thickness required (see 3.3.1 through 3.3.1.3).
- (e) When cut sheets may be furnished (see 3.3.1.1).
- (f) Special facing requirements (see 3.3.1.5.1).
- (g) Levels of packing required (see 5.2).
- (h) Special marking, if required (see 5.3.1).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraph.

<u>Paragraph no.</u>	<u>Data requirements title</u>	<u>Applicable DID no.</u>	<u>Option</u>
3.2	Certificate of compliance	DI-E-2121	10.1

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(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L, Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 First article inspection. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test must furnish evidence.

6.3.1 Guidelines. The following guidelines should be used to determine the necessity for required first article inspection for fire resistance:

- (a) If within the 3 year period preceding the date of invitation for bids the felt has not been tested by an acceptable testing laboratory and found in compliance with the requirements of this specification, or
- (b) If the material offered for delivery is not manufactured the same in all respects as that previously tested.

6.4 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material is acquired by the contractor for incorporation into the insulation felt and loses separate identity when the insulation felt is shipped.

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - ME
Navy - SH
Air Force - 99

Preparing activity:

Navy - SH
(Project 5640-0355)

Review activity:

Army - MI

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APPENDIX A

DETERMINATION OF THE FLASHOVER POTENTIAL OF A
LINING MATERIAL USING A QUARTER-SCALE ROOM FIRE TEST

10. SCOPE

10.1 Scope. This method describes a procedure to determine the flashover potential of materials in a room when subjected to a fire exposure. The method described will yield a time from the introduction of the fire exposure unit the moment of flashover. This appendix is a mandatory part of the specification. The information continued herein is intended for compliance.

10.2 JUSTIFICATION

10.2.1 In the interest of reduction, both the set-up time and cost associated with fire testing in a full size room (defined as a 10 by 10 by 8 feet high room having a 30 by 80 inch high doorway), a one-quarter scale room fire test was devised to predict flashover potential of lining materials exposed to fire.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. EQUIPMENT

30.1 The quarter-scale room shall be constructed from a suitable ceramic insulation board and shall form an airtight box having a ceiling and four sides. The box shall sit on a floor fabricated with the same material. The interior dimensions of the fully lined quarter-scale room are 30 by 30 by 24 inches high. The doorway is located at the center of one wall and shall be 19.5 inches wide and 17 inches high to secure the proper ventilation and fire development. The height between the finished ceiling and the top of the doorway shall be 7 inches. The floor of the model room shall extend at least 12 inches outside of the doorway. The box shall be removable to allow for application of ceiling and wall covering. The entire base of the box in contact with the floor shall be made airtight.

30.2 A porous plate diffusion flame burner shall be used as the fire source. The burner shall be 3.5 by 3.5 by 3 inches high, consisting of a horizontal porous plate area of 3 by 3 inches with a .25 inch wide steel plate perimeter and steel plate sides and bottom.

30.3 Four 10 mil chromel-alumel thermocouples shall be used, 1 inch and 3 inches below the center of the overhead and 1 inch and 2 inches below the top of the doorway.

40. PROCEDURE

40.1 The test material shall fully line the walls and ceiling.

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40.2 Prior to testing, the fully-lined test room shall be conditioned for at least 24 hours at a relative humidity between 20 and 60 percent, and a temperature of $23 \pm 50^{\circ}\text{C}$.

40.3 The fire source shall be positioned on the floor snugly against one near corner of the test room. A flow rate of $.32 \text{ ft}^3/\text{min}$ methane shall be used to produce a constant heat input to approximately 320 BTU for the duration of the test.

40.4 The test data from the four thermocouples shall be recorded as a continuous function of time.

40.5 The primary data generated by this test will be the time to flashover, if it occurs, and the maximum temperature if flashover is not reached. Flashover is characterized by thermal flux levels equal to or greater than 2 watts per square centimeter at the floor level. This corresponds to interior temperatures of 600°C and higher, and doorway temperatures of 500°C and higher. For this test purpose, flashover is defined as the fire condition when one of the interior thermocouple measurements reach 600°C or one of the doorway measurements reach 500°C , whichever occurs first. Flashover shall not occur within 10 minutes.

40.6 Color slides shall be taken before the test, at the point of maximum involvement and after the fire has been extinguished.

☆U.S. GOVERNMENT PRINTING OFFICE: 1982-505-022/4354

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DEPARTMENT OF THE NAVY

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