

MIL-I-2818B
 15 May 1968
 SUPERSEDING
 MIL-I-2818A
 25 May 1960
 (See 6.3)

MILITARY SPECIFICATION

INSULATION BLANKET, THERMAL, FIBROUS MINERAL

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

1. SCOPE

- 1.1 This specification covers wire reinforced fibrous mineral wool insulation blanket.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

- PPP-B-576 - Boxes, Wood-Cleated, Veneer, Paper Overlaid.
 PPP-B-585 - Boxes, Wood, Wire bound.
 PPP-B-591 - Boxes, Fiberboard, Wood-Cleated.
 PPP-B-601 - Boxes, Wood-Cleated, Plywood.
 PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
 PPP-B-636 - Boxes, Fiberboard.

MILITARY

- MIL-L-10547 - Liners, Case, and Sheet Overwrap, Waterproof, Flexible

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
 MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

- 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

Uniform Classification Committee

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Blvd., Chicago, Ill. 60606.)

American Trucking Associations, Inc.

National Motor Freight Classification Rules

(Application for copies should be addressed to the American Trucking Associations, Inc., 1616 P Street, Washington, D. C. 20036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

- ASTM-C-167 - Thickness and Density of Blanket-or-Butt Type Thermal Insulating Materials, Methods of Test for.

- ASTM-C-177 - Thermal Conductivity of Materials by Means of the Guarded Hot Plate, Method of Test for.

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(Application for copies of ASTM Standards should be sent to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

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

3. REQUIREMENTS

3.1 Material. The basic material shall consist of rock, argillaceous limestone, slag, glass, or mixtures of these, processed from a molten state into fibrous form and then felted and secured between metallic supporting members.

3.1.1 Mineral fiber.

3.1.1.1 Nonfibrous material (shot). The mineral fibers shall contain not more than 20 percent by weight of nonfibrous material (shot) (see 4.4.1).

3.1.1.2 Alkalinity. The alkalinity of the mineral fibers expressed as sodium oxide (Na_2O) shall not exceed 0.60 percent (see 4.4.2).

3.1.1.3 Sulfur. The mineral fibers shall contain not more than 0.50 percent of sulfur (see 4.4.3).

3.1.2 Binder. If a binder is required in the manufacturing of the blanket, it shall not exceed 1.5 percent of the weight of the fibrous mineral component of the blanket (see 4.4.4).

3.1.3 Supporting members. The supporting mesh shall consist of one inch wire, approximately 0.036 inches in diameter, on both sides, or wire mesh on one side and expanded metal lath on the other side, as specified (see 6.2).

3.2 Construction. The blanket shall be composed of felted fibrous mineral with or without a binder, secured between wire supporting members which are attached to each other by tie wires spaced approximately 7 inches apart passing vertically through the blanket.

3.3 Dimensions. The length, width and thickness of the blanket shall be as specified (see 6.2). A minus tolerance of 1/8 inch and an excess in all dimensions will be permitted (see 4.4.5).

3.4 Density. A cubic foot of the blanket, without supporting members, shall weigh not more than 12 pounds.

3.5 Thermal conductivity. The thermal conductivity (K) of the insulation blanket, without supporting members, shall not exceed 0.55 BTU per square foot per hour per degree Fahrenheit ($^{\circ}\text{F}$) for thickness of 1 inch at a mean temperature of 450°F (see 4.4.6).

3.6 Moisture absorption. The insulation blanket, without supporting members, shall not absorb more than 1.25 percent by weight of water (see 4.4.7).

3.7 Resistance to vibration. The insulation blanket shall not sag, settle or shake down when tested as specified in 4.4.8.

3.8 Workmanship. The blanket shall conform to the quality and grade of product established by this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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.

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4.2 Sampling.

4.2.1 Lot. For purposes of sampling, a lot shall consist of all insulation blankets of the same thickness produced under essentially the same conditions and offered for delivery at one time.

4.2.2 Sampling for visual and dimensional examination. A random sample of blankets shall be selected from each lot offered for examination in accordance with MIL-STD-105 at Inspection Level II and Acceptance Quality Level of 2.5 percent defective.

4.2.3 Sampling for quality conformance. From each lot, three sample blankets shall be selected in accordance with Inspection Level S-2 of MIL-STD-105 for the tests specified in 4.3.2.

4.3 Inspection.

4.3.1 Visual and dimensional examination. The samples selected in accordance with 4.2.2 shall be visually and dimensionally examined to verify compliance with this specification. Any blanket in the sample containing one or more visual or dimensional defects shall be rejected, and if the number of defective blankets in any sample exceeds the acceptance number for that sample, this shall be cause for rejection of the lot represented by the sample.

4.3.1.1 Classification of defects. Classification of defects shall be as specified in table I.

Table I - Classification of defects.

<u>Critical</u>	<u>Defects</u>
1	Jagged ends of mesh wire, tie wire, or expanded metal.
<u>Major</u>	
101	Length is less than specified Tolerance 1/8 inch short (3.3).
102	Width is less than specified Tolerance 1/8 inch short (3.3).
103	Thickness less than specified (3.2).
104	Spacing of tie wires exceeds 7 inches (3.2).
105	Tie wires not securely attached.
106	Mesh wires not properly spaced.
107	Expanded metal broken.
<u>Minor</u>	
201	Special marking not as required in contract or purchase order.

4.3.2 Quality conformance tests. The samples selected in accordance with 4.2.3 shall be subjected to the tests specified in 4.3.1 through 4.4.3. If the sample is found to be not in conformance with this specification, this shall be cause for rejection of the lot represented by the sample.

4.4 Test procedures.

4.4.1 Nonfibrous material (shot) content. The nonfibrous material (shot) content of 10 grams 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. Standards 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 of the fiber has been removed from the two sieves. The fine splinters and dust shall be aspirated and the remainder on the No. 30 and No. 50 sieves shall be combined and weighed, divided by the sample weight 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.

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4.4.2 Alkalinity. The alkalinity test shall be performed as follows: Weigh a 5 gram ± 0.01 gm) representative sample of the mineral fiber, and introduce into a 500 milliliter (ml) pyrex Erlenmeyer flask. Wet with 5 ml of 95 percent ethyl alcohol and add 400 ml of distilled water. Reflux for 4 hours ± 5 minutes. At the end of this period, disconnect the condenser and filter at once through a No. 41 Whatman paper, or its equivalent, supported in a Buechner funnel and connected to a suction source. Wash the flask and residual material three times with 25 ml portions of hot distilled water. Titrate the combined filtrate and wash solution immediately with 0.02N H_2SO_4 using 6 to 8 drops of a 1 percent solution of phenol red indicator to the disappearance of the pink color. Run a blank determination on the same amount of distilled water and alcohol and substitute the titration value in the formula below:

$$\text{Percentage alkalinity as } Na_2O = \frac{(A-B)N \times .031 \times 100}{W}$$

where A = ml H_2SO_4 required to titrate total sample

B = ml H_2SO_4 required to titrate blank

N = Normality of the H_2SO_4

W = Weight of samples in grams

A representative sample is conveniently prepared by taking borings with a large cork borer through the cross section of the insulation.

4.4.3 Sulfur content. The total sulfur content of the mineral fiber shall be determined by the following method:

A 0.5 gram representative sample of the mineral fiber is placed in a dry 30 cc iron crucible with 4 grams of sodium peroxide (Na_2O_2) and 6 grams of potassium carbonate (K_2CO_3) and intimately mixed. Cover the crucible and heat for 15 minutes in a sulfur-free flame until fusion is complete. Rotate the crucible while the melt solidifies. Following cooling, transfer the crucible and cover to a 400 ml beaker containing sufficient distilled water to cover crucible, add 5 to 10 ml of bromine water, and boil until the melt is dissolved and the bromine expelled. Let the precipitate settle and decant the supernatant liquid through a sintered crucible using suction. Wash with hot water until practically neutral. Acidify the filtrate with HCl, evaporate on a hotplate to dryness to dehydrate the silica. Take up in 400 ml of water, add 5 ml of dilute HCl and filter. Bring to a boil and slowly add 5 ml of 10 percent $BaCl_2$ solution. Let stand overnight, filter, wash, ignite and weigh the $BaSO_4$. Calculate the total sulfur as follows:

$$\text{Weight of } BaSO_4 \times \frac{0.1375 \times 100}{0.5} = \% \text{ sulfur}$$

4.4.4 Binder content. The binder content of each sample tested shall be determined by heating not less than 1/2 square foot of mineral fiber material separated into small pieces to approximately 800°F for 5 hours in an oven adequately vented in such a manner as to insure complete circulation of the atmosphere of the entire oven chamber, preferably by fan or other forced circulation methods. The weight before and after heating shall be taken under atmospheric conditions of the same relative humidity.

4.4.5 Thickness and density. The thickness and density of the insulation shall be determined in accordance with the method specified in ASTM C-167.

4.4.6 Thermal conductivity. Thermal conductivity shall be determined in accordance with the method specified in ASTM C-177.

4.4.7 Moisture absorption. A 3-1/2 by 3-1/2 x 3 inch specimen of the mineral fiber component shall be weighed and then subjected to an atmosphere of 90 \pm 3 percent humidity at 120° \pm 3°F for 6 hours. Weigh immediately upon removal from the test chamber and determine the percent moisture absorbed.

4.4.8 Resistance to vibration. Two 2 foot by 2 foot by 2 inch specimens of the blanket shall be mounted on the faces of an electrical heater plate. The ends of the heater plate shall be insulated and the entire assembly shall be fitted and mounted within a 1/16-inch thick sheet iron casing, 30 by 30 by 6 inches. The casing shall be mounted in a vertical position on a vibration test apparatus. The heater plate shall be maintained at a temperature of 750°F during the test. The specimens shall be subjected to 720 vibrations per minute through an arc of 15 minutes for a period of 100 hours of operation. At the end of the 100-hour period of operation, the outer metal casing of the assembly shall be removed and the condition of the specimens noted.

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4.5 Inspection of preparation for delivery. The preservation, packaging, packing and marking of the equipment shall be subject to inspection to determine compliance with the requirements of Section 5 of this specification.

5. PREPARATION OF DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements. Preparation for delivery requirements of referenced documents listed in Section 2 do not apply unless specifically stated in the contract or order. Preparation for delivery requirements for products procured by contractors shall be specified in the individual order.)

5.1 Packing.

5.1.1 Level A. Insulation blankets shall be packed in overseas-type wood-created fiberboard, nailed wood, wire bound wood, corrugated or solid fiberboard, wood-created paper overlaid, or wood-created plywood boxes conforming to PPP-B-576, PPP-B-591, PPP-B-621, PPP-B-636 Class weather resistant, and PPP-B-601, respectively. Shipping containers shall have case liners conforming to MIL-L-10547 and shall be closed and sealed in accordance with appendix thereto. Case liners may be omitted for boxes conforming to PPP-B-636 provided all corners and edge seams and manufacturers joint of the boxes are sealed with minimum 1-1/2 inch wide tape as specified in the appendix of the box specification. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitation of the applicable box specification.

5.1.2 Level B. Insulation blankets shall be packed in domestic-type wood-created fiberboard, nailed wood, wire bound wood, corrugated or solid fiberboard, wood-created plywood, or wood-created paper overlaid boxes conforming to PPP-B-576, PPP-B-591, PPP-B-621, PPP-B-585 class 1 or 2, PPP-B-636 class domestic and PPP-B-601, respectively. Closures shall be as specified in the applicable box specification, or appendix thereto. Fiberboard boxes shall not exceed the weight limitation of the applicable box specification. The gross weight of wood boxes shall not exceed 200 pounds.

5.1.3 Level C. Insulation blankets shall be packed in containers in a manner to insure safe delivery and acceptance at destination. Containers shall comply with the Uniform Freight Classification Rules or National Motor Freight Classification Rules.

5.2 Marking. In addition to any special marking required (see 6.2), shipments shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The blanket is intended for insulating hot surfaces of machinery, boilers and equipment at temperature up to 900°F.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Whether wire mesh on both sides or wire mesh on one side and expanded metal lath on the other side is required (see 3.1.3).
- (c) Length, width and thickness required. (see 3.3).
- (d) Level of packing required (see 5.1).
- (e) Special marking required (see 5.2).

6.3 CHANGES FROM PREVIOUS ISSUE. THE OUTSIDE MARGINS OF THIS DOCUMENT HAVE BEEN MARKED "X" TO INDICATE WHERE CHANGES (DELETIONS, ADDITIONS, ETC.) FROM THE PREVIOUS ISSUE HAVE BEEN MADE. THIS HAS BEEN DONE AS A CONVENIENCE ONLY AND THE GOVERNMENT ASSUMES NO LIABILITY WHATSOEVER FOR ANY INACCURACIES IN THESE NOTATIONS. BIDDERS AND CONTRACTORS ARE CAUTIONED TO EVALUATE THE REQUIREMENTS OF THIS DOCUMENT BASED ON THE ENTIRE CONTENT AS WRITTEN IRRESPECTIVE OF THE MARGINAL NOTATIONS AND RELATIONSHIPS TO THE LAST PREVIOUS ISSUE.

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