

MIL-C-17435C
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SUPERSEDING
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2 May 1955

MILITARY SPECIFICATION
CUSHIONING MATERIAL, FIBROUS GLASS

*This specification is approved for use by all departments and agencies of
the Department of Defense.*

1. SCOPE

1.1 Scope. This specification covers cushioning material composed of bonded fibrous glass.

1.2 Classification. The cushioning material shall be of the following types and classes as specified (see 6.3):

Type I - Uncoated
Type II - Coated.

Classes shall be as indicated in table II.

2. APPLICABLE DOCUMENTS

* 2.1 Issue of documents. The following documents of the issues in effect on date of invitation for bids or request for proposals form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

*O-M-232	Methanol (Methyl Alcohol)
*P-D-680	Dry Cleaning Solvent
*QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet

FSC 8135

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*QQ-C-576	Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed or Machined Edges (Plate, Bar, Sheet, or Strip)
RR-S-366	Sieve, Test
*MMM-A-260	Adhesive, Water-Resistant (For Sealing Waterproofed Paper)
*PPP-B-585	Boxes, Wood, Wirebound
*PPP-B-591	Boxes, Shipping
PPP-B-601	Boxes, Wood, Cleated-Plywood
*PPP-B-621	Boxes, Wood, Nailed and Lock-Corner
*PPP-B-636	Boxes, Shipping, Fiberboard
*PPP-B-1055	Barrier Material, Waterproofed, Flexible

Military

MIL-L-10547	Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof Flexible
*MIL-S-18729	Steel Plate, Sheet, and Strip, Alloy 4130, Aircraft Quality

STANDARDS

Military

MIL-STD-129	Marking for Shipment and Storage
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(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Materials. The cushioning material shall consist of glass fibers matted, bonded, and otherwise treated to meet the requirements of this specification for the type and class specified. The surface fibers of type II material shall be coated with an elastomeric material to prevent dusting. When required, a backing material shall be applied as specified by the procuring activity.

3.1.1 Fiber size and orientation. Unless otherwise specified, the glass fibers shall be oriented in a direction approximately perpendicular to the direction of loading of the cushioning material. When required, the range of fiber diameters shall be as specified by the procuring activity (see 6.3).

3.2 Forms and dimensions. Unless otherwise specified (see 3.2.1), fibrous glass cushioning material shall be furnished in sheet form, or in rolls when feasible, in the standard thicknesses shown in table I, and in lengths and widths specified by the procuring activity. Tolerances on lengths of sheets and on widths shall be $\pm 1/4$ inch. Tolerance on lengths of rolls shall be ± 1.5 percent.

TABLE I. Standard thicknesses.

Thickness (inch)	Tolerance (inch)
1/4	± 0.031
1/2	$\pm .062$
3/4	$\pm .062$
1	$\pm .062$

3.2.1 Special forms and dimensions. When specified by the procuring activity, cushioning material cut or molded to special forms, thicknesses, or other dimensions shall be furnished. Tolerances shall be as indicated in the applicable drawings or other documents.

3.3 Load-deflection values. The fibrous glass cushioning material shall have the load-deflection properties shown in table II and 3.3.1.

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TABLE II. Load-deflection values.

Class	Load range at 25% deflection (psi)	Maximum test deflection (%)	Load range at maximum test deflection (psi)
1	0.2-0.5	60	0.5-3.0
2	0.5-1.5	55	2.0-12
3	1.0-2.0	50	5.0-15
4	2.0-4.0	50	10-25
5	3.0-8.0	45	15-30
6	6.0-15	40	25-50
7	10-20	35	40-80
8	20-50	35	45-90
9	50-100	30	50-120

3.3.1 Overload. When tested as specified in 4.4.4.4., the redetermined load shall be within 15 percent of the original load required to produce the maximum test deflection value indicated in table II for the class of material tested.

3.4 Compression set. After compression to the maximum test deflection shown on table II (see 4.4.5) corresponding to the class of material, the compression set after 48 hours shall not exceed 5.0 percent of the original thickness.

3.5 Load-deflection at 250° F.¹ At a temperature of 250° ± 5° F, the load (see 4.4.6) required to produce the maximum test deflection shown in table II for material of the corresponding class shall be at least 50 percent of the load for the same deflection at room temperature.

3.6 Compression set at 250° F.¹ The material, when tested as specified in 4.4.7 at a temperature of 250° ± 5° F, using deflection values one-half as great as the maximum test deflections for the corresponding class in table II, shall show a compression set not exceeding 5 percent of the original thickness.

3.7 Accelerated aging.¹ After heating as specified in 4.4.8 for 15 hours at 300° ± 10° F, then testing at room temperature as in 4.4.4.4, the loads required to produce the maximum test deflections shown in table II shall be within 5 percent of the original loads.

¹Not applicable for Air Force purchases.

3.8 Dusting. When tested as specified in 4.4.9, the weight loss for type I material shall not exceed 0.25 percent of the original weight of the sample. For type II material the weight loss shall not exceed 0.05 percent, and the surface coating shall show no separation from the fibers.

3.9 Flame resistance. When tested as specified in 4.4.10, the material shall not support combustion after removal from the flame. A glow is permitted for not more than 15 seconds thereafter.

* 3.10 Metal corrosion. When tested as specified in 4.4.11, specimens of steel, copper, and aluminum alloy in contact with the cushioning material shall show no more corrosion than the control specimens.

3.11 Water resistance. The binder shall not dissolve in distilled water, and the cushioning material shall retain its original shape and form after removal from water, when tested as specified in 4.4.12.

3.12 Workmanship. Cushioning material shall be manufactured in accordance with the highest standards of workmanship. The material shall be as uniform as commercially possible and shall be practically free of irregularities, loose or unbonded fibers, nonfibrous glass, or other occlusions.

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 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.

* 4.2 Sampling.

4.2.1 Lot. For sampling purposes, a lot shall consist of all cushioning material of the same type and class offered for delivery at the same time.

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4.2.2 Samples. Five pieces, 12 inches square, or the equivalent in molded or special forms, shall be selected from each lot. Where the sizes and forms are not suitable for preparation of test specimens, sufficient material representative of the lot shall be furnished in a form suitable for such preparation.

4.3 Inspection.

* 4.3.1 Visual and dimensional inspection. The samples shall be examined for compliance with the requirements of 3.1 to 3.2.1, 3.12, and section 5.

4.4 Test procedures.

4.4.1 Test conditions. Unless otherwise specified by the procuring activity, tests and measurements shall be at a room temperature of 70° to 90° F. In case of dispute, the material shall be conditioned for at least 24 hours and tested at $73.5^{\circ} \pm 2^{\circ}$ F and relative humidity of 50 ± 4 percent.

4.4.2 Thickness. The thickness of sheet material shall be determined by means of a dial micrometer. The anvil for supporting the specimen shall be at least 2 inches in diameter. The micrometer presser foot shall be 1.129 inches \pm 0.005 inch in diameter and loaded so as to exert a force of 1 ± 0.05 ounce on the specimen. Surfaces of the anvil and presser foot shall be parallel within 0.001 inch. The micrometer foot shall be lowered gradually, without shock, and allowed to settle for 5 seconds before taking a reading. At least 5 readings, all at least 2 inches from the edge of the sheet, shall be taken and the average used in determining compliance with table I.

4.4.3 Lengths and widths. Lengths and widths of sheet shall be measured to an accuracy of 1/64 inch. Lengths of rolls shall be measured to the nearest inch.

4.4.4 Load-deflection and overload.

4.4.4.1 Specimens. Specimens for the load-deflection tests shall be 4 by 4 inches by the thickness of the sheet. For irregular forms, specimens shall be as close to these dimensions as possible. At least three specimens shall be tested and the average value for the three specimens used in determining compliance with table II.

4.4.4.2 Testing machine. Any compression testing machine accurate to ± 1 percent of the load to be measured may be used.

4.4.4.3 Micrometer. A dial micrometer accurate to 0.001 inch shall be attached to the machine so as to indicate the actual distance between the surfaces of the specimen under test.

4.4.4.4 Procedure. The specimen shall be compressed to the 25 percent and "maximum test" deflection values indicated in table II for the proper class, and each load recorded. The specimen shall then be overloaded, using a load equal to twice that for the maximum test deflection. After release of this load, the load for the maximum test deflection shall be redetermined and compared with the original load.

4.4.5 Compression set.

4.4.5.1 Specimens. The specimens shall be similar to those used for the load-deflection tests (4.4.4). At least three specimens shall be tested and the average value used to determine compliance.

4.4.5.2 Procedure. The thickness of the specimen shall be measured as in 4.4.4.3. The specimen shall then be compressed to the maximum test deflection corresponding to its class as given in table II and shall remain compressed for 48 hours. The load shall then be released and the thickness redetermined after 1 minute. Compression set shall be calculated as a percentage of the original thickness as follows:

$$\text{Compression set, \%} = \frac{t_0 - t_1}{t_0} \times 100$$

where

t_1 = final thickness

t_0 = original thickness.

4.4.6 Load-deflection at 250° F. The loads required to produce the maximum test deflections of table II shall be determined as in 4.4.4, using an insulated apparatus to maintain the specimen at $250^\circ \pm 5^\circ$ F for at least 15 minutes before and during the test.

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4.4.7 Compression set at 250° F. Compression set shall be determined in the apparatus used in 4.4.4. The deflection shall be one-half of that of the maximum test deflection used in the room temperature test, and the specimen shall remain under compression for 2 hours at $250^{\circ} \pm 5^{\circ}$ F. The load shall then be released and the specimen allowed to cool for 15 minutes at room temperature before remeasuring the thickness. The average value for at least three specimens shall be determined. Compression set at 250° F shall be calculated as in 4.4.5.2.

4.4.8 Accelerated aging. Specimens similar to those used in 4.4.4 shall be stored for 15 hours in an oven at $300^{\circ} \pm 10^{\circ}$ F, allowed to cool for 2 hours at room temperature, and then tested as in 4.4.4.

4.4.9 Dusting. A test specimen 2 inches square and not less than 1/2 inch thick shall be weighed to the nearest 0.001 gram, after particles resulting from cutting have been removed. A cylindrical weight of 0.75 ± 0.01 pound, 1.375 inches ± 0.005 inch in diameter shall be dropped squarely upon the test specimen from a height of 10 inches above its top surface, using a pipe or tube of slightly larger diameter as a guide. After a total of 10 such impacts the specimen shall be cleaned with a brush, reweighed to the nearest 0.001 gram, and the percentage loss calculated.

4.4.10 Flame resistance. One end of a specimen at least 1/4 inch thick by 1/2 inch wide by any convenient length shall be held for 1 minute in a bunsen burner flame 1 inch high, within a draft-free enclosure, and then observed for compliance with 3.9.

* 4.4.11 Metal corrosion.

* 4.4.11.1 Test specimens. Two test specimens, approximately 0.020 inch by 1 inch by 4 inches, of each of the following shall be used:

Steel: MIL-S-18729, cold-rolled, No. 3-quarter-hard temper, dull finish.

Copper: QQ-C-576, cold-rolled, light temper.

Aluminum alloy: QQ-A-250/4, temper T-3.

* 4.4.11.2 Preparation of test specimens. The test specimens shall first be polished by means of a fine abrasive cloth to remove any rust

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or discoloration, then cleaned by means of a dry-cleaning solvent, P-D-680, and rinsed in methanol, O-M-232. Unless placed under test immediately, the specimens shall be stored in a desiccator.

* 4.4.11.3 Test procedure. For each of the 3 metals, one specimen shall be placed between 2 pieces of cushioning material approximately 1/2 inch by 1 inch by 4 inches in size. The cushioning shall be secured by means of twine or tape so as to maintain close contact with the metal. The other specimen of each metal shall be used as the control. All specimens shall be suspended vertically in an atmosphere of 65 ± 5 percent relative humidity at a temperature of $120^\circ \pm 3^\circ$ F for 96 hours, after which they shall be examined for compliance with 3.10. If any of the metals in contact with the cushioning material shows appreciably greater corrosion than the control specimen, this shall be cause for rejections. Slight discolorations may be ignored.

4.4.12 Water resistance. A 3-inch square specimen supported on a 1/2-inch standard sieve (RR-S-366, type I, class 2) shall be immersed in distilled water for 6 hours at a temperature of $70^\circ \pm 5^\circ$ F, and then examined for compliance with 3.11.

* 5. PACKAGING

5.1 Packing. Unless otherwise specified, cushioning material shall be packed in shipping containers with paper separators between adjacent sheets. Special forms shall be wrapped to prevent injury or abrasion. Suitable blocking, bracing, and cushioning shall be provided to prevent movement within the boxes.

5.1.1 For domestic shipment, immediate use. Containers shall comply with the carrier regulations applicable to the mode of transportation.

* 5.1.2 For domestic shipment and storage. Unless otherwise specified, cushioning material shall be packed in wood-cleated fiberboard, wood-cleated plywood, nailed wood, wire-bound wood, corrugated fiber, or solid fiber boxes conforming to PPP-B-591, PPP-B-601, PPP-B-621, PPP-B-585, or PPP-B-636, respectively. Gross weight of wooden boxes shall not exceed 200 pounds. Gross weights of fiberboard boxes shall be subject to the limitations of the box specification, and the fiberboard shall meet the special requirements of the applicable specification.

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5.1.3 For overseas shipment. Cushioning material for overseas shipment shall be packed as specified in 5.1. Shipping containers shall be cleated plywood, nailed, or wire-bound (overseas type) wood boxes conforming to PPP-B-601, type III, class I, PPP-B-621, or PPP-B-585, respectively, or fiberboard boxes conforming to PPP-B-636. Shipping containers, excepting those conforming to PPP-B-636, shall be lined with waterproof case liner of material conforming to PPP-B-1055, type C-1 or C-2, or to MIL-L-10547 with seams and closures sealed with adhesive conforming to MMM-A-140. Shipping containers shall be strapped in accordance with the requirements of the appendix of the applicable box specification. The gross weight of each box shall not exceed 200 pounds.

5.2 Marking. Wherever possible, individual sheets shall be stamped to indicate the class of material. Rolls, when possible, shall be marked at intervals throughout the roll. Containers of specially molded or cut forms shall be marked to identify the contents. Shipping containers shall be marked in accordance with MIL-STD-129. Marking shall include the title, number, and date of this specification, and the type, class, and size of the cushioning material.

6. NOTES

6.1 Intended use. Fibrous glass cushioning material is intended for use in protecting packaged or installed equipment against shock and vibration. A temporary skin irritation may occur as a result of handling fibrous glass products, especially if rubbed against the skin. Minute fibers sticking to the skin are readily removed by ordinary washing. Suitable precautions and adequate ventilation should be used when there is any possibility of particles falling into the eyes, or of accumulation of dust in the air.

6.2 Selection of class of cushioning material. The proper class of cushioning material to be used for any given application will depend on the impact energies which are to be absorbed by the cushioning, so that damage to the packaged or supported articles will not occur. Approximate load-deflection values for use in engineering design are given in table III.

6.3 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification
- b. Type, class, and thickness of cushioning material
- c. Forms or dimensions

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- d. Range of fiber diameters, if required
- e. Type and quality of backing, if required
- f. Name of manufacturer
- g. Contract or order number
- h. Type of packing required.

TABLE III. Approximate deflections (percent of original thickness) for loads shown.

Class	Load in pounds per square inch								
	0.2	0.5	1.0	2.0	5.0	10	20	50	100
1	20	40	50	60	-	-	-	-	-
2	10	20	25	40	50	55	-	-	-
3	-	10	20	30	40	50	-	-	-
4	-	-	12	20	30	40	50	-	-
5	-	-	10	15	25	35	45	-	-
6	-	-	-	10	18	25	35	45	-
7	-	-	-	-	12	20	30	40	-
8	-	-	-	-	8	15	20	35	-
9	-	-	-	-	-	8	10	20	30

* 6.4 The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was 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 irrespective of the marginal notations and relationship to the last previous issue.

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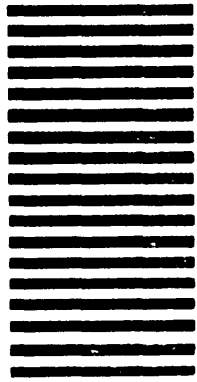
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