

MIL-M-44104A
20 October 1987
SUPERSEDING
MIL-M-44104
27 May 1983

MILITARY SPECIFICATION

MAT, SLEEPING

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

1. SCOPE

1.1 Scope. This document covers a sleeping mat.

2. APPLICABLE DOCUMENTS

* 2.1 Government documents.

- * 2.1.1 Documents. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-B-601 - Boxes, Wood, Cleated-Plywood
PPP-B-636 - Boxes, Shipping, Fiberboard

MILITARY

MIL-T-5038 - Tape, Textile and Webbing, Textile, Reinforcing, Nylon
MIL-T-43548 - Thread, Polyester Core: Cotton-, Rayon-, or
Polyester-Covered

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8465

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STANDARDS

FEDERAL

- FED-STD-191 - Textile Test Methods
- FED-STD-751 - Stitches, Seams, and Stitchings

MILITARY

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

DRAWINGS

U.S. ARMY NATICK RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER

- 2-3-438 - Mat, Sleeping

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

- * 2.2 Other publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS, specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issues of the nongovernment documents which are current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 3575 - Flexible Cellular Materials Made From Olefin Plastics
- D 3951 - Standard Practice for Commercial Packaging

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

- * 2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Standard sample. Standard samples will be furnished by the Government. The color of the foam (see 3.4) shall be equal to the standard sample (see 6.3).

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- * 3.2 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.3, 6.2 and 6.4).

3.3 Materials (see 6.5).

3.4 Mat body. The body of the mat shall be manufactured from closed cell expanded cross-linked polyethylene foam. The material shall be physically blown using nitrogen, or chemically blown using a nitrogen blowing agent which is non-toxic, and whose products of decomposition are non-toxic. The color of the foam shall be olive drab in accordance with the standard sample. The length of the mat shall contain not more than one lateral weld.

3.4.1 Securing tapes. The tapes shall be 3/4 inch wide, olive drab color, conforming to type III of MIL-T-5038. The position and length of the tapes shall conform to Drawing 2-3-438. Ends of securing tape shall be seared.

3.4.2 Patches. The patches shall be cut from a polychloroprene coated woven nylon cloth, black or olive drab in color and uniformly coated on the both sides of the cloth. The location and dimensions of the patch shall conform to Drawing 2-3-438.

3.4.3 Base nylon cloth. The nylon base cloth shall be constructed with 28 to 33 yarns per inch for the warp and filling and shall weigh 5.9 to 10 ounces per square yard.

3.4.4 Coated base cloth. The weight of the coated base cloth shall be 15 to 19.2 ounces per square yard.

3.4.5 Adhesive. The patches shall be secured to the mat with a polychloroprene based self-vulcanizing adhesive, or an approved alternative, abrading the surface of the mat and patch as necessary. The patch adhesion (peel force required to remove patches from the mat) shall be not less than 11.2 pounds when tested as specified in 4.4.4.

3.4.6 Thread. The threads shall be cotton-, rayon-, or polyester-covered polyester thread conforming to MIL-T-43548, ticket number (size 16), three or four plies, color Olive Drab S-1, CA 66022.

3.5 Construction. The construction shall conform in all respects to Drawing 2-3-438 and as specified herein. The physical properties of the body of the mat shall conform to the requirements specified in table I when tested as specified in 4.4.4.

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TABLE I. Physical properties of expanded polyethylene mat body

Property	Requirement
Tensile strength, p.s.i., min	70
Elongation, percent, min	100
Tearing resistance, lbs/inch, min	15
Density, lbs/cu ft, max	3.6
Shrinkage, percent, max	15
Compression strain:	
10 psi, percent, max	35
30 psi, percent, max	65
Compression set:	
22 hrs at room temp, percent, max	45
22 hrs at 0 degrees F, percent, max	55
Water absorption, percent, max	17
Weld strength per inch width, min	16.9 lbs (breaking strength)

- * 3.5.1 Stitches, seams and stitchings. All stitches, seams and stitching shall conform to type 301 of FED-STD-751 with 6 to 8 stitches per inch. The type of seam and stitching shall conform to Drawing 2-3-438 and as specified herein. End of stitching shall be overlapped 1/2 inch to prevent ravelling.

3.5.2 Thread tension. Thread tension shall be maintained so that there will be no loose stitching resulting in loose bobbin or top thread, or excessively tight stitching resulting in puckering of the materials sewn. The lock shall be embedded in the materials sewn.

- * 3.5.3 Repairs of type 301 stitching. Repairs of type 301 stitching shall be as follows:

a. When thread breaks or bobbin run-outs occur during sewing, the stitching shall be repaired by restarting the stitching a minimum of 1/2 inch back of the end of the stitching.

b. Thread breaks or two or more consecutive skipped or run-off stitches noted during inspection of the item (in-process or end item) shall be repaired by over-stitching. The stitching shall start a minimum of 1/2 inch back of the

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defective area, continue over the defective area, and continue a minimum of 1/2 inch beyond the defective area onto the existing stitching. Loose or tight stitching shall be repaired by removing the defective stitching without damaging the material and restitching in the required manner. 1/

1/ When making the above repairs, the ends of stitching are not required to be backstitched.

3.5.4 Automatic stitching. Automatic machines may be used to perform any of the required stitch patterns provided the requirements for the stitch pattern, stitches per inch, and size and type of thread are met, and at least three or more tying, overlapping, or back stitches are used to secure the ends of the stitching. As an alternate, 11 to 14 stitches per inch may be used.

* 3.5.5 Thread ends. All thread ends that are visible on the finished item shall be trimmed to a length of not more than 1/4 inch.

* 3.6 Workmanship. The mat shall conform to the quality of product established by this document and the occurrence of defects shall not exceed the applicable acceptable quality levels.

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 this document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

* 4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this document shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the document shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

* 4.1.2 Certificate of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

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4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection. When a first article is required (see 6.2), it shall be examined for the defects specified in 4.4.2 and 4.4.3. The presence of any defect shall be cause for rejection of the first article.

4.4 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this document or applicable purchase document. In addition, the testing shall be performed on components listed in table II for characteristics noted. Unless otherwise indicated, testing shall be conducted in accordance with FED-STD-191. All requirements are applicable to the sample unit. All test reports shall contain the individual values utilized in expressing the final results. Unless otherwise specified in subsidiary documents, sampling shall be in accordance with the following:

<u>Lot size (yards)</u>	<u>Sample size</u>
800 or less	2
801 up to and including 22,000	3
22,001 and over	5

The lot shall be unacceptable if one or more sample units fail to meet any test requirement specified. The unit for expressing lot size and sample unit for testing each component shall be in accordance with applicable subsidiary specifications and as follows:

<u>Component</u>	<u>Lot size unit expressed as</u>	<u>Sample unit for testing</u>
Coated cloth for adhesive patches	Yards	1/3 sq. yard

TABLE II. Component tests

<u>Component</u>	<u>Characteristic</u>	<u>Requirement paragraph</u>	<u>Test method</u>
Patches	Composition	3.4.3	1/
	Coating	3.4.3	Visual

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TABLE II. Component tests (cont'd)

Component	Characteristic	Requirement paragraph	Test method
Base cloth	Yarns per inch	3.4.4	5050 <u>1/</u>
	Weight	3.4.4	5040 <u>1/</u>
Coated cloth	Weight	3.4.5	5041
Adhesive	Composition	3.4.6	<u>1/</u>

1/ A certificate of compliance shall be submitted and will be acceptable for the stated requirement.

4.4.2 End item visual examination. The end item shall be examined for the defects listed below. The lot size shall be expressed in units of mats. The sample unit shall be one complete mat. The inspection level shall be II and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0.

Examine	Defect
Securing tapes	Any tape missing or not properly located Not color specified Ends not seared
Adhesive patch	Any patch missing or not properly located Not adhered over entire area Not color specified Not uniformly coated on both sides
Stitching	Number of stitches per inch more or less than required Not overstitched as required
Mat body	Any cut, split, tear, hole, or crack Not uniform, contains large voids More than one lateral weld in any mat Weld not complete Not clean or presence of foreign matter

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- * **4.4.3 End item dimensional examination.** The end item shall be examined for conformance to the dimensions shown on the drawing. Any dimension not within the specified tolerance shall be classified as a defect. The lot size shall be expressed in units of mats. The sample unit shall be one mat. The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.
- * **4.4.4 End item testing.** The end item shall be tested for the characteristics listed in table III. The lot size shall be expressed in units of one mat. The sample unit shall be one mat. For all testing, the inspection level shall be S-2. Any test failure shall be cause for rejection of the lot.

TABLE III. End item tests

Characteristic	<u>Specification reference</u>		<u>Results reported as</u> Pass or fail
	Requirement	Test method	
Tensile strength	Table I	ASTM D 3575	X
Elongation	Table I	ASTM D 3575	X
Tearing resistance	Table I	ASTM D 3575	X
Density	Table I	ASTM D 3575	X
Shrinkage	Table I	4.5.3	X
Compression strain:			
10 p.s.i.	Table I	ASTM D 3575	X
30 p.s.i.	Table I	ASTM D 3575	X
Compression set:			
22 hrs at room temp	Table I	ASTM D 3575	X
22 hrs at 0°F	Table I	ASTM D 3575	X
Water absorption	Table I	ASTM D 3575	X
Weld strength	Table I	4.5.1	X
Patch adhesion	3.4.6	4.5.2	X

- * **4.4.5 Packaging examination.** The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

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<u>Examine</u>	<u>Defect</u>
Marking	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application.
Materials	Any component missing, damaged, or not as specified.
Workmanship	Inadequate application of components, such as: incomplete sealing or closure of container flap, loose strapping, or inadequate stapling.
Content	Number is more or less than required.

* 4.5 Methods of inspection.

* 4.5.1 Weld strength test. Specimens shall be cut, 1-inch wide by 6 inches long with the weld perpendicular to and centered along the 6-inch direction, and tested in a constant strain tensile machine at a rate of separation of the jaws of 2-inches per minute. The weld strength shall be reported to the nearest 1 pound (breaking strength) per inch.

* 4.5.2 Patch adhesion test. Adhesion of the patches to the body of the mat shall be checked by cutting specimens, at the point of attachment of the patches to the body of the mat, equal in width to the superimposed patches, and allowing a free length of mat material to remain attached at least 6 inches in length. Tapes should similarly be left attached. Specimens shall be modified at the trailing edge of the patch by severing completely through the nylon tape and mat body material, leaving the patch bonded to the mat body with the remainder of the nylon tape and mat body material pointing normally in the same direction. The free end of the tape shall be mounted in the top jaw of a constant strain tensile machine. The free end of the mat body shall be bent through 180 degrees and inserted in the bottom jaw of the machine. Local trimming of the mat body material may be necessary to facilitate fitting the mat body material into the jaw. The machine shall be set to run at a rate of separation of the jaws of 2 inches per minute and the peel strength determined. The results shall be reported to the nearest 0.1 pound. Adhesion shall be determined not less than 7 days after manufacture.

* 4.5.3 Heat shrinkage. The test method for determining the heat shrinkage is as follows:

4.5.3.1 Apparatus.

- a. 12 inch ruler graduated in 0.1 inch dimensions.
- b. Air circulating oven capable of maintaining $200^{\circ} \pm 2^{\circ}\text{C}$.
- c. Aluminum or steel plate about 14 inches square and approximately 0.060 inch thick.

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4.5.3.2 Specimen preparation. Three test specimens each measuring approximately 10 inches by 1 inch by 3/8 inch shall be cut using a die stamp or other suitable means from the sample. Samples shall not be tested less than 24 hours after manufacture. The specimen shall be marked by any suitable means about 1 inch from each end of the specimen and the distance between the two marks shall be measured to the nearest 0.1 inch.

4.5.3.3 Procedure. The three specimens shall be lightly dusted with french chalk and placed in an oven at $200^{\circ} \pm 2^{\circ}\text{C}$ on a preheated aluminum or steel plate similarly dusted with french chalk. After 5 minutes \pm 2 seconds the plate and specimens shall be removed from the oven and the specimens tipped, as quickly as possible, onto a nonconducting surface such as asbestos and allowed to cool for 15 minutes. The metal plate shall then be redusted and replaced in the oven. No further tests shall be performed until both the oven and metal plate have remained at 200°C for at least 5 minutes. The timing of the heating period shall commence when the oven is closed and finished when the door is opened. Any temperature drop due to the insertion of the test specimens shall be ignored. No more than six specimens shall be tested at any one time. After the specimens have been allowed to cool for at least 15 minutes, the distance between the marks shall be measured to the nearest 0.1 inch.

4.5.3.4 Calculation of results. The heat shrinkage shall be calculated as follows:

$$S = \frac{L_1 - L_2}{L_1} \times 100$$

S = Percentage heat shrinkage
 L₁ = Original length in inches
 L₂ = Final length in inches

5. PACKAGING

5.1 Packing. Packing shall be level A, B, or Commercial as specified (see 6.2).

5.1.1 Level A. Fifty sleeping mats shall be packed in a shipping container conforming to overseas type, style optional, of PPP-B-601. Sleeping mats shall be packed flat, fifty in depth within a shipping container. Inside dimensions of each shipping container shall be approximately 76 inches in length, 24-1/2 inches in width, and 21-1/2 inches in depth. Approximate dimensions are furnished as a guide only. Each shipping container shall be closed and strapped in accordance with the appendix of PPP-B-601.

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5.1.2 Level B packing. Fifty sleeping mats shall be packed in a fiberboard shipping container conforming to style FTC, type of (variety SW) or SF, class domestic, grade 275 of PPP-B-636, except the size limitations shall be waived. Sleeping mats shall be packed flat, fifty in depth within a shipping container. Inside dimensions shall be approximately 76 inches in length, 24-1/2 inches in width, and 21-1/2 inches in depth. Approximate dimensions are furnished as a guide only. Each shipping container shall be closed in accordance with the appendix of PPP-B-636 except that the inspection shall be in accordance with 4.4.5.

5.1.2.1 Weather-resistant fiberboard containers. When specified (see 6.1), the shipping container shall be a grade V3c, V3s, or V4s fiberboard box constructed and closed in accordance with PPP-B-636 except that the inspection shall be in accordance with 4.4.5.

* 5.1.3 Commercial packing. Sleeping mats shall be packed in accordance with ASTM D 3951.

* 5.2 Marking. In addition to any special marking required by the contract or purchase order, shipping containers shall be marked in accordance with MIL-STD-129 or ASTM D 3951, as applicable.

6. NOTES

6.1 Intended use. The sleeping mat is intended for use as a ground cover in conjunction with the sleeping bag.

* 6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this document.
- b. When a first article sample is required (see 3.2, 4.3, and 6.4).
- c. Selection of applicable levels of packing (see 5.1).
- d. When weather-resistant grade fiberboard shipping containers are required for level B packing (see 5.1.2.1).

6.3 Samples. For access to standard samples, address the contracting activity issuing the invitation for bids.

* 6.4 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should include specific instructions in all instruments regarding arrangements for selection, inspection, and approval of the first article.

6.5 Recycled material It is encouraged that recycled material be used when practical as long as it meets the requirements of this document (see 3.3).

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- * 6.6 Changes from previous issue. The margins of this document have been marked with an asterisk (*) 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 as written, irrespective of the marginal notations and relationship to the last previous issue.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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1. DOCUMENT NUMBER MIL-M-44104A		2. DOCUMENT TITLE MAT, SLEEPING	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
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