

INCH-POUND
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27 September 2004
SUPERSEDING
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PERFORMANCE SPECIFICATION

RUBBER OR PLASTIC SHEETS AND ASSEMBLED AND MOLDED SHAPES, SYNTHETIC, FOAM OR SPONGE, OPEN CELL

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

1. SCOPE

1.1 Scope. This specification covers inherently combustion retardant flexible foam or sponge materials with low emission of smoke and toxic products to be used for mattresses, cushioning, and packaging applications.

1.2 Classification. Cellular synthetic rubber or plastic will be of the following type, class, and conditions, as specified (see 3.6.1, 3.6.2.1, and 6.2):

Type II - Uncored.

Class 5 - Fire retardant, low smoke (for shipboard use).

Condition A - Medium.

Condition B - Medium firm.

Condition C - Firm.

Condition D - Soft.

Comments, suggestions, or questions on this document should be addressed to Commander, Naval Sea Systems Command, ATTN: SEA 05Q, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to commandstandards@navsea.navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-293 - Visual Inspection Guide for Cellular Rubber Items.

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch> or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

BUREAU OF MEDICINE AND SURGERY (BUMED)

BUMED INST 6270.8 - Procedures for Obtaining Health Hazard Assessments Pertaining to Operational Use of a Hazardous Material.

(Copies of this document are available online at <https://bumed.med.navy.mil> or from Bureau of Medicine and Surgery, Department of the Navy, 2300 E Street, NW, Washington, DC 20372-5300.)

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

S9510-AB-ATM-010 Rev 2 of 30 July 1992 - Nuclear Powered Submarine Atmosphere Control Manual.

(Copies of this document are available from the Naval Sea Systems Command, Code SEA 05Z9, 1333 Isaac Hull Avenue, SE, Stop 5133, Washington Navy Yard DC 20376-5133.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes. (DoD adopted)

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(Copies of this document are available from www.asq.org or American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203.)

ASTM INTERNATIONAL

ASTM C 739 - Standard Test Method for Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation. (DoD adopted)

ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers Tension. (DoD adopted)

ASTM D 573 - Standard Test Method for Rubber-Deterioration in an Air Oven. (DoD adopted)

ASTM D 945 - Standard Test Methods for Rubber Properties in Compression or Shear (Mechanical Oscillograph). (DoD adopted)

ASTM D 1055 - Standard Specifications for Flexible Cellular Materials - Latex Foam. (DoD adopted)

ASTM D 3574 - Standard Methods for Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams. (DoD adopted)

(Copies of these documents are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA, 19428-2959.)

2.4 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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Material. The base material shall be a synthetic rubber or plastic cellular compound processed to meet all of the requirements of this specification. The use of reclaimed or natural rubber is prohibited.

3.3 Construction.

3.3.1 Form. The material shall have a polymerized or vulcanized homogeneous (free from foreign material) cellular structure with a porous surface and open cells. The cells shall be interconnecting and uniform in size. The form of the material shall be in sheets or in assembled or molded shapes, as specified (see 6.2). Solid fillers, flame retardant chemicals, and other additives used to achieve appropriate performance standards as specified in this specification shall not be deemed "foreign" material within the meaning of this section.

3.3.2 Finish. When a finish, such as a cloth scrim, is required to improve the strength, tear resistance, and so forth on the finished shape, it shall be as specified (see 6.2).

3.3.3 Manufacturing requirements. Cellular material for mattresses and cushions may be molded in one piece or may be assembled by laminating to achieve thickness, and by butting to achieve width or length. Assembled items shall be cemented together. Incidental defects in the cellular material which occur in standard manufacturing practices and assembly will be allowed if they are corrected as indicated and the resulting product conforms to this specification.

(a) Tears occurring during removal from mold shall be cemented together.

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- (b) Changes in volume during cure, resulting in surface depressions or minor changes in size, shall be corrected by addition of material of identical composition and buffed to a level surface.
- (c) Laminae products shall be scrim-reinforced provided such scrim reinforcing does not add to flammability or smoke emission of the material. Also, scrim reinforcing will be permitted as long as the surfaces of the mattress are not wrinkled. Scrim reinforcing is defined as woven cloth fabric bonded to the cellular surfaces to add to the tensile strength of the assembly.
- (d) Where laminae assembly is employed to achieve thickness, the laminae shall be as thick as possible but in no case less than 1/2-inch.
- (e) Seams that are cemented shall not cause distortion of the base material in an uncompressed state or when compressed to 75 percent of the original height. Cemented seams shall exhibit strength greater than the base material.
- (f) For cushions, a maximum of two sections may be butted together to achieve width or length. Sections are defined as pieces of full thickness which are the full width or length of the item. Lamination may be used to achieve thickness.

3.4 Odor. The material shall be properly cured in order to prevent any objectionable odor. (An objectionable odor shall be defined as one that is atypical of cellular rubber compound.) The material shall conform to the requirements of paragraph 5.6 of ASTM C 739.

3.5 Dimensions and tolerances. Dimensions of all sheets, molded or assembled shapes shall be as specified (see 6.2), and within the tolerances or dimensions of latex foam rubber products for general applications in accordance with ASTM D 1055.

3.6 Physical properties.

3.6.1 Indentation. The indentation of each class and condition of uncured material shall be as specified in Table I or II.

TABLE I. Indentation and apparent density of mattress insert material (Type II mattress inserts only).

Class	Condition	Indentation, pounds required to compress 50 square inches (in ²) of a 43-inch specimen 25 percent	Apparent density, pounds per cubic foot (lb/ft ³) (maximum) based on gross volume
Class 5	Medium	25 to 42	8.0
	Medium firm	30 to 55	9.0
	Firm	42 to 60	9.2

3.6.2 Density.

3.6.2.1 Type II. The maximum apparent density of each class and condition of uncured material shall be as specified in Table I or II.

TABLE II. Indentation and density of cushioning material (Type II nonmattress inserts).

Class	Condition	Indentation, pounds required to compress 50 in ² of a 43-inch specimen 25 percent - test method ASTM D 3574	Apparent density, (lb/ft ³) (maximum) based on gross volume	Compression resistance Oscillograph lb/in ² to compress to 25 percent
Class 5	Soft	10 to 25	7.5	0.20 to 0.50
	Medium	25 to 42	8.0	over 0.50 to 0.84
	Medium firm	30 to 55	9.0	0.60 to 1.10
	Firm	42 to 60	9.2	over 0.84 to 1.70

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3.6.3 Compression resistance (for Type II, other than mattress inserts). Compression resistance of each condition of cellular material shall be as specified in Table II.

3.6.4 Low temperature compression resistance (Type II mattress inserts only). Compression resistance of Type II material shall not change more than 70 percent from the initial values when tested at low temperature.

3.6.5 Compression set. Compression set of the cellular material shall be not greater than 10 percent for class 5 material.

3.6.6 Flexing. Cellular material shall withstand flexing, without physical breakdown of cellular structure. After the flexing test, the set remaining after 1 hour at rest shall be not greater than 10 percent.

3.6.7 Accelerated aging.

3.6.7.1 Air-oven aging. After air-oven aging, the change in indentation or compression, as applicable, of the cellular material shall be not greater than 20 percent from the values obtained before aging.

3.6.7.2 Air-pressure heat aging. Cellular material shall withstand the air-pressure heat aging test for 2 hours without changing shape, hardening, softening, or becoming tacky.

3.6.8 Fire performance.

3.6.8.1 Burning characteristics. The cellular material shall have a maximum net peak heat release rate not greater than 150 kilowatts (kW). Burning droplets shall not be formed and drop to the floor or the top of the weighing platform.

3.6.8.2 Smoke generation. The cellular material shall have an average specific extinction area not greater than 300 square meters per kilogram (m²/kg).

3.6.9 Bend fatigue resistance (mattress inserts only). The cellular material shall not crack before or after aging.

3.6.10 Tensile strength and ultimate elongation. Tensile strength of the material shall be not less than 9 lb/in². Ultimate elongation shall be not less than 100 percent for class 5 material.

3.6.11 Cemented seam strength. Cemented seams shall be stronger than the base material, both initially and after oven aging.

3.6.12 Steam autoclave effect. The material shall be exposed in a steam autoclave. Exposed material shall conform to the following requirements:

- (a) Compression force deflection change - 25 percent, maximum.
- (b) Constant deflection compression set - 25 percent, maximum.

3.6.13 Dynamic fatigue. Material thickness shall not decrease by more than 10 percent maximum.

3.7 Identification. Each sheet, molded or assembled shape, shall be marked in a permanent and legible manner with the following information. If the item is too small for marking, the information shall be provided on the wrapping or container of each item (see 6.2).

Manufacturer
Date of manufacture
Contract number and lot (if applicable)

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Specification number

Type

Class

Condition

3.8 Workmanship. Material shall be of uniform texture, be free of obvious manufacturing imperfections which may impair serviceability, and meet the requirements of this specification.

3.9 Off-gassing. The material shall meet the requirements in the Nuclear Powered Submarine Atmosphere Control Manual, S9510-AB-ATM-010 Rev 2 of 30 July 1992, for a usage category of Limited (see 4.6 and 6.5).

3.10 Toxicity. The material shall have no adverse effect on the health of personnel when used for its intended purpose. The material shall be assessed by the Navy Environmental Health Center (NAVENVIRHLTHCEN) using the administrative Health Hazard Assessment (HHA). A flowchart for this process can be found as enclosure (1) of BUMEDINST 6270.8. The HHA is a review of the material based on information submitted by the manufacturer, to assess health hazards associated with the handling, application, use and removal of the product. The material shall not cause any environmental problems during waste disposal (see 4.7 and 6.6).

4. VERIFICATION

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

- (a) First article inspection (see 4.2).
- (b) Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall consist of the examinations and tests specified in Table III, 4.4.1, 4.5.8, 4.5.9, 4.6, and 4.7.

4.2.1 Sampling for first article inspection. Sufficient first article samples shall be taken from the first production lot and tested as specified in 4.2.

4.3 Conformance inspection. Conformance inspection shall consist of the examinations and tests specified in 4.4 through 4.7, as applicable.

4.3.1 Sampling for conformance inspection.

4.3.2 Lot. A lot shall consist of all material of the same type, class, and condition produced in one plant under the same conditions, and offered for delivery at one time.

4.3.3 Sampling for examination. Sample sheets or molded or assembled shapes shall be taken from each lot in accordance with ASQC Z1.4 at inspection level II. Major and minor defects shall be classified in accordance with MIL-STD-293.

4.3.4 Sampling for tests. Representative samples shall be taken at random from each lot that passes the examination of 4.4.1, in sufficient quantity to conduct either the production check tests or the conformance tests of 4.4.2 and 4.4.3, as applicable. For mattresses and seat cushions, the sample unit shall be a minimum of three each one-half mattresses. Samples shall be selected from the production line and shall be complete in all respects, namely, with authorized repairs, taping, and marking. No substitute samples shall be permitted for mattresses and seat cushions. If, for applications other than mattresses and seat cushions, the items are of such size or shape that test specimens cannot be prepared from them, substitute samples shall be provided in the form of one sheet 4 feet long by 2.5 feet wide by 1 inch thick, and one piece 12 by 12 by 4 inches. Where the substitute samples represent items which are laminated to achieve thickness, the substitute sample shall contain the same number of seams,

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including the scrim reinforcement. The substitute samples shall be of the same material and equivalent cure as that used in the lot of finished material offered for delivery (see 4.5).

4.4 Examination and tests.

4.4.1 Examination. Each of the samples taken as specified in 4.3.2 shall be examined for workmanship, visual defects, dimensions, tolerances, and marking. Determination and evaluation of visual defects shall be in accordance with MIL-STD-293.

4.4.2 Conformance check tests. Conformance check tests shall be conducted on end item samples from (or representing) the first lot of material and once every 10 lots thereafter. All applicable tests as specified in Table III shall be conducted.

TABLE III. End item tests.

Characteristic	Requirement	Test procedure	Requirement applicable to sample unit	Lot average	Number of determinations per sample unit	Results reported as
Odor	3.4	4.5.13	X	-	5	Required by ASTM C 739
Indentation	3.6.1	4.5.1	X	-	1	To nearest 0.5 pound per 50 square inches
Density: Uncored material	3.6.2.1	4.5.2	X	-	1	To nearest 0.1 lb/ft ³
Compression resistance	3.6.3	4.5.3	-	X	3	To nearest 0.1 lb/in ²
Low temperature compression resistance	3.6.4	4.5.4	-	X	3	To nearest 1 percent
Compression set	3.6.5	4.5.5	-	X	3	To nearest 0.1 percent
Flexing:						
Physical break-down set	3.6.6	4.5.6	X	-	1	Pass or fail
Set	3.6.6	4.5.6	X	-	1	To nearest 0.1 percent
Air-oven aging	3.6.7.1	4.5.7.1	-	X	2	To nearest 1 percent
Air-pressure heat aging	3.6.7.2	4.5.7.2	X	-	1	Pass or fail
Bend fatigue requirements:						
Before aging	3.6.9	4.5.10	X	-	1	Pass or fail
After aging	3.6.9	4.5.10	X	-	1	Pass or fail
Tensile strength	3.6.10	4.5.11	-	X	3	To nearest 0.1 lb/in ²
Ultimate elongation	3.6.10	4.5.11	-	X	3	To nearest 1 percent
Cemented seam strength:						
Before aging	3.6.11	4.5.12	X	-	1	Pass or fail
After aging	3.6.11	4.5.12	X	-	1	Pass or fail
Steam autoclave	3.6.12	4.5.14	X	-	3	Pass or fail
Dynamic fatigue	3.6.13	4.5.15	X	-	1	To nearest 1 percent

4.4.3 Conformance tests. Conformance tests shall be conducted on end item samples from (or representing) all intermediate lots on which the production check tests were not conducted. Unless otherwise specified (see 6.2), the applicable test specified in Table III shall be conducted except those for flexing, air-

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pressure heat aging and low temperature compression resistance. The air-pressure heat-aging test shall be performed by the contractor on the first lot; subsequent testing will be performed by the Government as necessary.

4.5 End item testing. Testing of the completely fabricated item taken from the production line shall be performed as specified in Table III for the characteristics shown therein. The sample size shall be as specified in 4.3.4. Tests shall be conducted in accordance with applicable methods as specified. Unless otherwise specified (see 6.2), tests shall be conducted at a temperature of 70 ± 5 degrees Fahrenheit ($^{\circ}\text{F}$). Specimens shall be conditioned in an atmosphere of 50 ± 45 percent relative humidity, and a temperature of $73 \pm 4^{\circ}\text{F}$.

4.5.1 Indentation. The indentation of Type II mattress inserts shall be determined in accordance with ASTM D 3574, Test B₁ except that test specimens shall be not less than 15 by 15 by 3 inches and the values shall be obtained 5 seconds after the pressure foot has produced a 25 percent indentation in the cellular material.

4.5.2 Density. Density or apparent density shall be determined by accurately weighing and measuring the cellular sample and dividing the weight by the volume. The volume of irregular-shaped pieces shall be determined as follows: The sample shall be placed in a graduated container and then completely surrounded by 10 to 14 mesh, free flowing seed, such as flaxseed, so that the sample is covered to a depth of 1 inch. The true or apparent volume (as applicable) of the seed plus the sample shall be noted, the sample removed, and the volume of the seed determined. The volume of the sample shall be determined by deducting the volume of the seed from the volume of seed plus sample.

4.5.3 Compression resistance. The compression resistance of Type II cellular material shall be determined in accordance with ASTM D 945.

4.5.4 Low temperature compression set.

4.5.4.1 Low temperature compression resistance (Type II mattress inserts only). Compression resistance at low temperature shall be determined in accordance with ASTM D 1055, after conditioning for $5 \pm 1/4$ hours at minus $20 \pm 2^{\circ}\text{F}$.

4.5.4.2 Compression resistance at low temperature (Type II other than mattress inserts). Compression resistance shall be determined in accordance with ASTM D 1055, after conditioning for $5 \pm 1/4$ hours at minus $10 \pm 2^{\circ}\text{F}$.

4.5.5 Compression set. Compression set of the cellular material shall be determined in accordance with compression set under the constant deflection procedure of ASTM D 3574, except that the specimens shall be compressed to 50 percent of their original height for a period of $46 \pm 1/4$ hours at room temperature. The thickness of the specimens shall be determined 1 minute after removal from the compression apparatus. The compression set shall be calculated and expressed as a percentage of the original height of the sample tested.

4.5.6 Flexing. The flexing endurance of the cellular material shall be determined in accordance with ASTM D 1055. The thickness of the specimen shall be measured 1 hour after completion of the test, and the percent set calculated as follows:

$$\text{Percent set} = \frac{(a-b)}{a} \times 100$$

Where:

a = original thickness before flexing.

b = thickness 1 hour after flexing.

The percent set reported shall be the average of the results obtained from the test conducted.

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4.5.7 Accelerated aging.

4.5.7.1 Air oven aging. A test specimen and apparatus as specified for the compression resistance test in 4.5.3 shall be used for this test. The specimen shall be subjected to aging in a circulating air oven of the type specified in ASTM D 573 for $70 \pm 1/2$ hours at $212 \pm 2^\circ\text{F}$. After aging, the load required to compress the un-aged specimen 25 percent shall be applied to the compression resistance apparatus. At least four equal weights shall comprise this load and the weights shall be added separately at 1-minute plus or minus 2-second intervals. The percent compression obtained shall be recorded as the compression of the aged specimen. Change in compression resistance shall then be calculated by the following formula:

$$\text{Percent of change in compression resistance} = \frac{X-25}{75} \times 100$$

Where:

X = percent compression (after aging) when subjected to the load which was required to produce 25 percent compression on unaged specimen.

This test shall be run in duplicate and the results averaged.

4.5.7.2 Air-pressure heat aging. The cellular material shall be air-pressure aged in accordance with ASTM D 1055. The specimen shall be visually examined to determine its condition as specified in 3.6.7.2. Specimens for this test shall be of any convenient size to permit visual examination. Where laminae construction is employed to achieve specified product thickness, the specimen shall contain the maximum number of cemented seams, including scrim reinforcement where employed, but in no case less than one.

4.5.8 Burning characteristics. The cellular material shall be tested as specified in appendix A.

4.5.9 Smoke generation tests. Smoke generation tests shall be conducted as specified in appendix A.

4.5.10 Bend fatigue test.

4.5.10.1 Test specimen. The specimen shall be the full specified product thickness by $4 \pm 1/4$ inches wide by at least four times its thickness in length.

4.5.10.2 Apparatus. The following apparatus shall be used:

- (a) Set of two parallel metal compression plates as shown on Figure 1.
- (b) Aging chamber in accordance with ASTM D 573.

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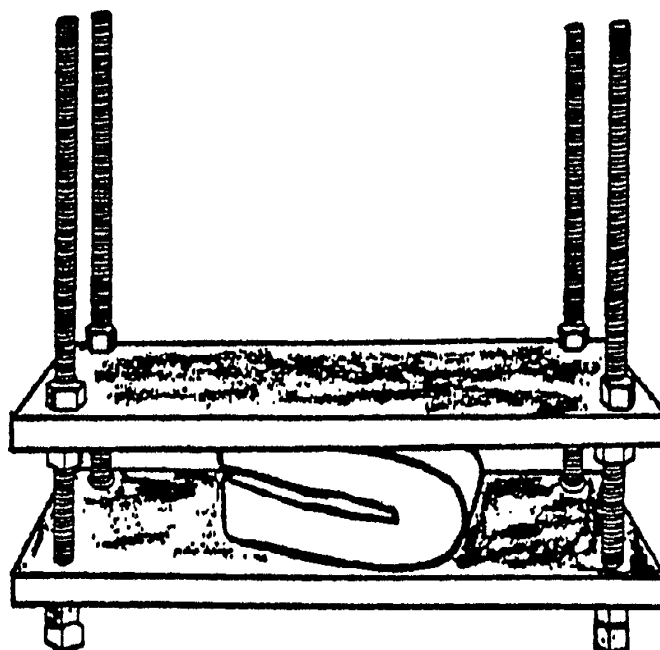


FIGURE 1. Specimen positioned in test apparatus for fatigue test.

4.5.10.3 Procedure. The specimen shall be folded crosswise and inserted between the two compression plates; skin side out, if there is more skin on one side. The opening between the compression plates shall be adjusted to two times the thickness of the unfolded specimen. The specimen shall be examined visually without magnification for cracks in the outer folded edge. The assembly shall be aged for $22 \pm 1/4$ hours at $158 \pm 2^\circ\text{F}$. After aging, the specimen shall again be examined visually for cracks.

4.5.11 Tensile strength and ultimate elongation. Three test specimens, 1 inch by 6 inches by 1/2 inch (plus or minus 0.0625) shall be cut from the top portion of the material. The length of the test specimens shall be parallel to the length of the material and the cut edges shall be perpendicular to the top surface and free of ragged edges. The specimens shall contain no scrim reinforced laminae. If the item to be tested is assembled of scrim reinforced laminae, three additional specimens cross-sectional (through all laminae) shall be required. The tensile strength and ultimate elongation of the test specimens shall then be determined in accordance with ASTM D 3574, Test E.

4.5.12 Cemented seam strength.

4.5.12.1 Specimen. The specimen used in this test shall be of any convenient length and shall have a cross-section of 1/2 by 1 inch. The cemented seam shall be across this cross-section, duplicating production as nearly as practical. Where the mattress is of laminae construction, a multiplicity of cemented seams shall be included.

4.5.12.2 Apparatus. The following apparatus shall be used:

- (a) Testing machine in accordance with ASTM D 412.
- (b) Aging chamber in accordance with ASTM D 573.

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4.5.12.3 Procedure. The specimen shall be tested perpendicular to the cemented seams in the testing machine. The elapsed time before testing the cemented seams shall be not less than 24 hours at $70 \pm 5^\circ\text{F}$ after cementing and not less than $70 \pm 1/2$ hours at $158 \pm 2^\circ\text{F}$ after aging.

4.5.13 Odor test. The odor test shall be conducted in accordance with ASTM C 739, Section 13.

4.45.14 Steam autoclave test. Material shall be tested in accordance with ASTM D 3574, test J₁.

4.5.15 Dynamic fatigue. Material shall be tested in accordance with ASTM D 3574, test I₂, procedure B.

4.6 Off-gassing. The material shall be tested in accordance with the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010/(U), by a Government approved testing facility. The results shall be submitted to the Government for evaluation and approval for use (see 3.9 and 6.5).

4.7 Toxicity. To determine conformance with the requirements of 3.10, the material shall be evaluated using the HHA process. Sufficient data to permit a HHA of the product shall be provided by the manufacturer/distributor to the NAVENVIRHLTHCEN. To obtain current technical information requirements specified by the NAVENVIRHLTHCEN, see 6.6.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The material covered by this specification is intended for use in cushioning, packaging, and in mattresses.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of the specification.
- (b) Type, class, and condition required (see 1.2).
- (c) Whether first article is required (see 3.1).
- (d) Form of material required (sheets or shapes) (see 3.3.1).
- (e) When finishing is required and material to be used (see 3.3.2).
- (f) Dimensions required (see 3.5).
- (g) If additional marking is required (see 3.7).
- (h) If off-gas testing is required (see 3.9).
- (i) Conformance tests if other than as specified (see 4.4.3).
- (j) Test conditions if other than as specified (see 4.5).
- (k) Toxicity conformance (see 4.7 and 6.6).
- (l) Packaging requirements (see 5.1).

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(m) Material safety data sheet (MSDS) requirements (see 6.4).

6.3 Design information. Unless a particular type of cellular material is specifically desired, the type should not be specified. The approximate compressibility and density should be determined and detail drawings and specifications should designate the material by indentation, of compression resistance and density required. Table IV reflects a comparison of compression resistance measured in terms of 50 ~~in~~² square inches with corresponding densities obtainable in uncored material.

TABLE IV. Comparison of compression resistance.

		Mattress inserts		Cushioning material	
		Indentation		Compression resistance ^{1/}	
Class	Condition	Pounds	Apparent density (max) lb/ft ³	Pounds	Apparent density (max) lb/ft ³
Class 5	Medium	25 to 42	8.0	25 to 42	8.0
	Medium firm	30 to 55	9.0	30 to 55	9.0
	Firm	42 to 60	9.2	42 to 60	9.2
	Soft	N/A	N/A	10 to 25	7.5

^{1/} The compression resistance for Type II material is based upon a maximum sample thickness of 1.125 inches (see 4.5.3). Material which is being acquired at a thickness exceeding 1.125 inches will possess a condition somewhat more firm than that indicated by its compression resistance value. Acquisition documents should specify the condition accordingly.

6.4 Material safety data sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.

6.5 Off-gassing. Materials to be installed in submarines are to be controlled to prevent off-gassing, which contaminates the atmosphere and results in health hazards to personnel or deleterious effects on machinery. These controls are accomplished through the Submarine Material Control Program, which is described in the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010/(U). Under the Submarine Material Control Program, all materials considered for use on submarines require certification and assignment of a usage category. Under the certification process, candidate materials are selected by Navy activities or contractors, and a request for certification is submitted to Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5122, Washington Navy Yard DC 20376-5122. The certification request is accompanied by detailed information, including descriptions of the material. A chemical analysis is conducted, which is normally accomplished through off-gas testing. The off-gas test is required to be conducted in a Government approved laboratory designated by the preparing activity. Information pertaining to this test requirement may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160. Based on the chemical analysis results, a usage category is assigned to the material defining whether, and to what extent, the material may be used on submarines.

6.6 Toxicity evaluation. The NAVENVIRHLTHCEN requires sufficient information to permit a HHA of the product. Any questions concerning toxicity and requests for HHA should be addressed to the Commanding Officer, Navy Environmental Health Center, ATTN: Hazardous Materials Department, Industrial Hygiene Directorate, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 20378-2103. Upon receipt of the HHA, a copy should be provided to Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5133, Washington Navy Yard, DC 20376-5160.

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6.7 Subject term (key word) listing.

Cushioning, foam or sponge

Mattresses, foam or sponge

Packaging, foam or sponge, fire retardant

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

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APPENDIX A

METHOD OF TEST FOR FIRE CHARACTERISTICS OF MATTRESSES
USING AN OPEN FLAME IGNITION SOURCE

A.1 SCOPE

A.1.1 Scope. This method of test, using an open calorimeter system, is used to determine heat release, weight loss, and generation of carbon monoxide and carbon dioxide of mattresses and bedding assemblies. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

A.2 APPLICABLE DOCUMENTS

A.2.1 General. The documents listed in this section are specified in Appendix A of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in Appendix A of this specification, whether or not they are listed.

A.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

STATE OF CALIFORNIA

TB 133 - Flammability Test Procedure for Seating Furniture for use in Public Occupancies.

(Application of copies should be addressed to the State of California, Building Standards Commission, Department of Consumer Affairs, Bureau of Home Furnishings and Thermal Insulation, 1300 I Street, Suite 720, Sacramento, CA 95815.)

A.2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM E 1537 - Standard Test Method for Fire Testing of Real Scale Upholstered Furniture Items.

(Copies of these documents are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA, 19428-2959.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 267 - Method of Test for Fire Characteristics of Mattresses and Bedding Assemblies Exposed to Flaming Ignition Source.

(Copies of this document are available from www.nfpa.org or the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.)

A.2.4 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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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A.3 TEST METHOD

A.3.1 General. This test method shall be used to determine performance of mattresses and bedding assemblies exposed to a flaming ignition source. The test shall be conducted without bedclothes. Heat release rate (HRR) is indicated by measurement of oxygen depletion, and smoke generation is determined by smoke density measurement systems. Weight loss shall be recorded. While this test utilizes a full-scale open calorimeter, research has shown that tests conducted inside a test room as specified in both ASTM E 1537 and the California Technical Bulletin TB 133 provide comparable heat results for test specimens having heat release rates of 600 kW or less.

A.3.2 Test procedure. The test procedure shall be in accordance with NFPA 267, with the following exceptions:

- (a) The test sample shall be a full sized mattress mounted on an open frame bunk or support system which will allow direct flame impingement to the bottom surface and sides of the mattress by the ignition source.
- (b) The "T" burner specified in NFPA 267 shall be replaced with a burner having a nominal 12 x 12 inches (305 x 305 millimeters (mm)) top surface. The burner shall have a minimum 4 inch (102 mm) layer of Ottawa silica sand to provide the horizontal surface through which the gas is supplied. The sand layer shall be flush with the top of the burner as shown on Figure 2.

A.3.3 Burner position. The burner shall be positioned such that the top edge of the burner is 15 ± 0.5 inches (381 ± 12.7 mm) below the bottom edge of the test specimen and centered with respect to the long side of the test specimen with one-half of the width of the burner under the mattress as shown on Figure 3.

A.3.4 Exposure. The test specimen shall be exposed to a fire producing a total heat output of 50 ± 3 kW for the first 5 minutes of the test followed by an increase to 100 ± 5 kW for an additional 10 minutes. The total fire exposure time shall be 15 minutes.

A.3.5 Test results. In addition to the items specified in NFPA 267, the following shall also be recorded:

- (a) The "Net Peak HRR (kW)" which is defined as the maximum heat release rate obtained during the test minus the burner heat input at the time the peak heat release rate occurs.
- (b) Total smoke released (m^2).
- (c) Average specific extinction area (m^2/kg) which is defined as the total smoke released (m^2) divided by the total mass loss (kg).
- (d) Total percentage of mass loss (%).

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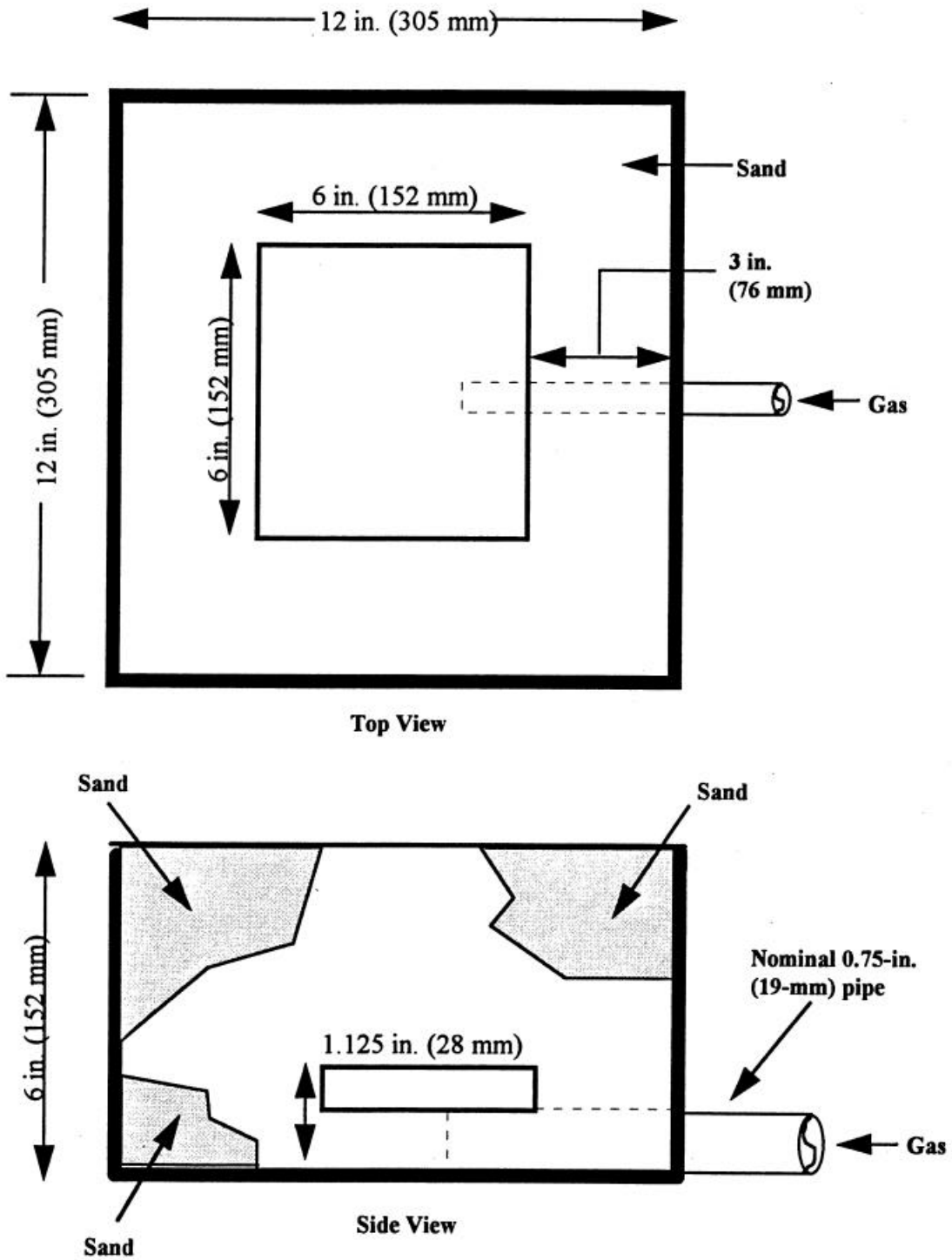
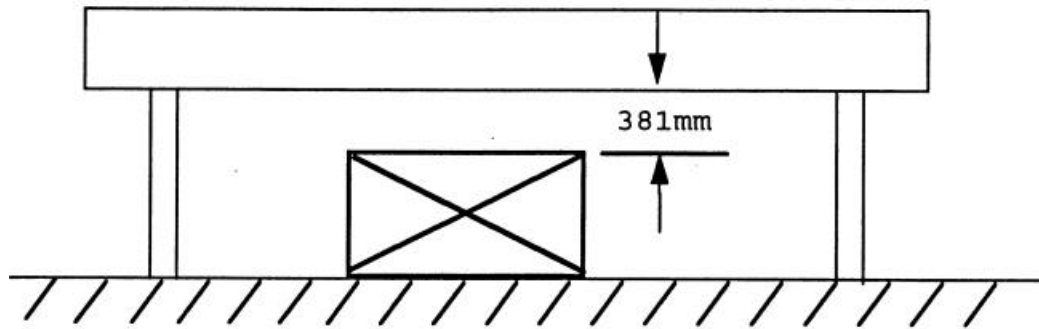
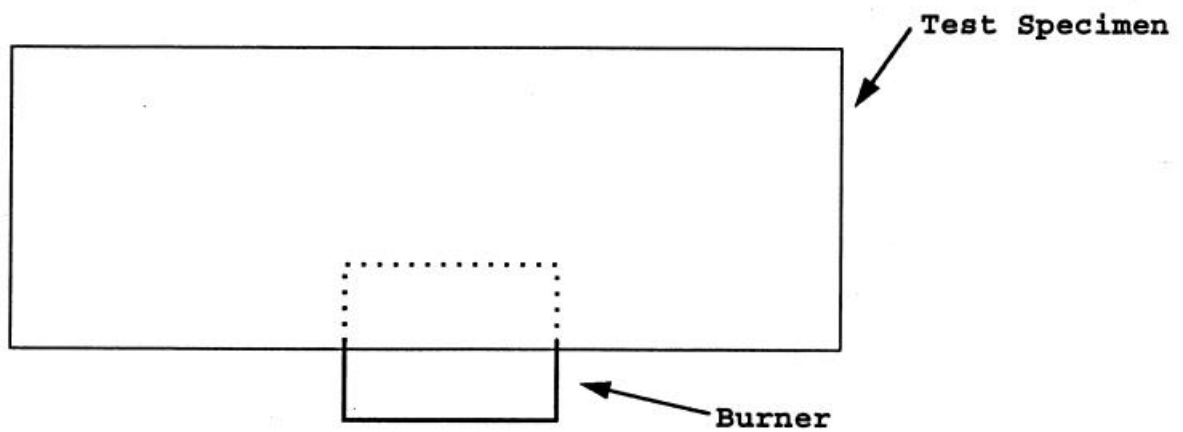


FIGURE 2. Gas burner.

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Elevation View of Test Specimen & Burner



Plan View of Test Specimen Burner

FIGURE 3. Test specimen and burner layout.

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Custodians:
Army - MR
Navy - SH

Preparing activity:
Navy - SH
(Project 9320-0034)

Review activities:
Army - AR, EA, MI
Navy - EC, MC
DLA - GS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at www.dodssp.daps.mil.