

INCH-POUND

MIL-PRF-32568

20 December 2016

PERFORMANCE SPECIFICATION
MATTRESS, INNERSPRING, FLAME RESISTANT, SHIPBOARD

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

1. SCOPE

1.1 Scope. This specification covers flame resistant innerspring shipboard mattresses (see 6.3.5) for use aboard U.S. Navy vessels.

1.2 Classification. The mattresses covered by this specification are of the following sizes, as specified (see 6.2).

1.2.1 Sizes. The sizes of mattress are as follows (see 3.5):

- a. 1 – Crew (Short)
- b. 2 – Crew (Regular)
- c. 3 – Crew (Long)
- d. 4 – Chief Petty Officer (CPO) (Regular)/Officer (Narrow)
- e. 5 – CPO (Long)
- f. 6 – Crew Sub (Small)
- g. 7 – Crew Sub (Regular)
- h. 8 – Officer (Wide)
- i. 9 – Officer/CPO Sub

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@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 <https://assist.dla.mil>.

AMSC N/A

FSC 7210

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1.3 Part or identifying number (PIN). PINs to be used for a mattress acquired to this specification are created as follows:

M **32568** - **X**
 Prefix for Military Specification - Size (see
 Specification Number code below)

| Size Code | |
|------------------|-------------|
| Size | Code |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |

Examples:

M32568-1

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 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 or 4 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.

COMMERCIAL ITEM DESCRIPTIONS

A-A-50195 - Thread, Aramid

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-129 - Military Marking for Shipment and Storage

(Copies of these documents are available online at <http://quicksearch.dla.mil>.)

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.

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NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

S9510-AB-ATM-010 - Nuclear Powered Submarine Atmosphere Control Manual

(Copies of the chapter titled “Material Control Program” are available by email request to CommandStandards@navy.mil.)

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 D1424 | - | Standard Test Method for Tearing Strength of Fabrics by Falling-Pendulum (Elmendorf-Type) Apparatus |
| ASTM D3574 | - | Standard Test Methods for Flexible Cellular Materials – Slab, Bonded, and Molded Urethane Foams |
| ASTM D3776/D3776M | - | Standard Test Method for Mass Per Unit Area (Weight) of Fabric |
| ASTM D5034 | - | Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test) |
| ASTM D6193 | - | Standard Practice for Stitches and Seams |
| ASTM D6413/D6413M | - | Standard Test Method for Flame Resistance of Textiles (Vertical Test) |
| ASTM D6988 | - | Standard Guide for Determination of Thickness of Plastic Film Test Specimens |
| ASTM E162 | - | Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source |
| ASTM E662 | - | Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials |
| ASTM E800 | - | Standard Guide for Measurement of Gases Present or Generated During Fires |
| ASTM E1590 | - | Standard Test Method for Fire Testing of Mattresses |
| ASTM F1566 | - | Standard Test Methods for Evaluation of Innersprings, Boxsprings, Mattresses or Mattress Sets |

(Copies of these documents are available online at www.astm.org.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

- | | | |
|---------------|---|---|
| ISO/IEC 17025 | - | General Requirements for the Competence of Testing and Calibration Laboratories |
|---------------|---|---|

(Copies of this document are available online at www.iso.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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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3. REQUIREMENTS

3.1 **First article.** When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.1.

3.2 **Components.** All component materials of the mattress shall be flame resistant and conform to the requirements of [table I](#).

3.2.1 **Recycled, recovered, environmentally preferable, or biobased materials.** Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

TABLE I. Component requirements.

| Component | Characteristic | Requirement |
|---|---------------------------------|--|
| Border ticking, upholstery ticking | Tear strength | Warp: 3.5 lbs min.; Filling: 3.5 lbs min. |
| | Breaking strength | Warp: 94 lbs min.; Filling: 58 lbs min. |
| | Weight (oz/yd ²) | 6.5 (min.); 8.5 (max.) |
| Insulator fabric | Tear strength | Warp: 4.0 lbs min.; Filling: 1.5 lbs min. |
| | Breaking strength | Warp: 70 lbs min.; Filling: 20 lbs min. |
| Upholstery ticking ^{1/} , border ticking ^{1/} , insulator fabric, flange, and tape ^{2/} | Flammability: | |
| | Char length | 5.0 inches max. |
| | After flame | 2.0 seconds max. |
| | Molten or flaming drops | None |
| Cushioning pad and quilting foam | Flammability: | |
| | Flame spread | 10 (max.) and no molten or flaming drops |
| | Smoke density, D _{MAX} | 200 and no molten or flaming drops ^{2/} |
| | Fire gas toxicity | ^{3/} |
| NOTES: | | |
| ^{1/} The flammability tests shall be performed in the initial condition and after conducting 15 laundering cycles (see table IV). | | |
| ^{2/} The only characteristic the tape is required to meet is the molten or flaming drops requirement. | | |
| ^{3/} See 3.8.2. | | |

3.2.2 **Ticking fabric.** The ticking (see 6.3.10) fabric shall be permanently fire retardant and have an alternating blue warp stripe pattern on bleached or natural white background. The flammability and physical requirements shall be as required by [table I](#).

3.2.3 **Thread.** The thread used for assembling components of the mattress shall be polyaramid in accordance with A-A-50195 in size, finish, and ply to meet all requirements of this specification. Nylon thread shall be used for quilting of sleeping surfaces to ensure that the mattress will meet durability requirements.

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3.2.4 Innerspring core. The innerspring core (see 6.3.2) shall be constructed from 14.5-gauge all-wire carbon steel to ensure that the firmness and durability requirements are met. The coils shall be assembled and fixed into individual rows to suit the length and width of the mattress size specified. The core shall be designed to extend to the full length and width of the finished mattress (see [table III](#)). The tolerance for the core when inside a finished mattress shall not recede more than ½ inch in the length direction on each side and no more than ¼ inch in the width direction on each side when measured from the mattress stitch line. The coils shall be permanently secured to provide long-term structural stability. The coils shall be assembled into a spring core unit by helically linking the individual coils.

3.2.5 Quilting foam. The quilting foam shall consist of flame resistant cushioning upholstery (see 6.3.11) foam that is integral with a fabric scrim backing.

3.2.5.1 Quilting foam density. The density of quilting foam shall be 6.0 ± 1.0 pounds per cubic foot (lb/ft³) when tested in accordance with 4.5.1.b.

3.2.5.2 Quilting foam compression set. The compression set of the quilting foam shall be 12 percent maximum at a 50 percent deflection when tested in accordance with 4.5.1.d.

3.2.5.3 Quilting foam tensile strength. The tensile strength of the quilting foam shall be 5.0 pounds per square inch (lb/in²) minimum when tested in accordance with 4.5.1.e.

3.2.5.4 Quilting foam flammability. The quilting foam flammability shall be in accordance with the requirements in [table I](#) when tested in accordance with [table IV](#).

3.2.6 Insulator fabric. The insulator fabric shall be 100 percent cotton, plain weave to ensure a durable layer is provided to protect the foam cushioning pad from spring coils and to ensure fabric will not melt or drip when exposed to elevated temperatures. The weight shall be 3.6 ± 0.3 ounces per square yard (oz/yd²), and have a minimum thread count of 30 in the warp direction and 25 in the fill direction. The fire performance shall be as required by [table I](#) when tested in accordance with [table IV](#).

3.2.7 Cushioning pad (topper). The cushioning pad (see 6.3.3) shall be flame resistant synthetic foam.

3.2.7.1 Cushioning pad thickness. The thickness of the cushioning pad shall be no less than $\frac{1}{2} \pm \frac{1}{16}$ inch thick and shall be determined in accordance with 4.5.1.a.

3.2.7.2 Cushioning pad density. The density of the cushioning pad shall be 7.2 ± 0.7 lb/ft³ when tested in accordance with 4.5.1.b.

3.2.7.3 Cushioning foam indentation force deflection (IFD). The cushioning foam shall have an IFD of 47 ± 7 pounds at 25 percent deflection at a 2-inch thickness when tested in accordance with 4.5.1.c.

3.2.7.4 Cushioning pad compression set. The compression set of the cushioning pad shall be 10 percent maximum for a 50 percent deflection when tested in accordance with 4.5.1.d.

3.2.7.5 Cushioning pad tensile strength. The tensile strength of the cushioning pad shall be 12 lb/in² minimum when tested in accordance with 4.5.1.e.

3.2.7.6 Cushioning pad tear strength. The tear strength of the cushioning pad shall be 2.5 lb/in minimum when tested in accordance with 4.5.1.f.

3.2.7.7 Cushioning pad resiliency. The resiliency of the cushioning pad shall be 30 percent minimum when tested in accordance with 4.5.1.g.

3.2.7.8 Cushioning pad dry heat aging. The change in IFD after dry heat aging shall be 20 percent maximum when tested in accordance with 4.5.1.h.

3.2.7.9 Cushioning pad foam flammability. The cushioning pad foam flammability shall be in accordance with the requirements in [table I](#) when tested in accordance with [table IV](#).

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3.2.7.10 Border ticking. The basic material for the border (see 6.3.1) ticking shall be a durable flame resistant cloth that shall be identical to that of the ticking used on the upholstery panels. The fire performance shall be as required by [table I](#) when tested in accordance with [table IV](#).

3.2.7.11 Flange. The flange (see 6.3.4) shall be made of durable flame resistant material. The flange shall be made of not more than two pieces of material with the ends spliced and sewn together in a continuous manner, leaving no breaks in uniformity and finish. The ends of the flange shall overlap a minimum of 6 inches. The fire performance shall be as required by [table I](#) when tested in accordance with [table IV](#).

3.2.7.12 Tape. The tape shall be made of durable flame resistant material and shall be used to conceal the seams formed between the border and the upholstery panel. The fire performance shall be as required by [table I](#) when tested in accordance with [table IV](#).

3.3 Design requirements. In order to ensure that the mattress will meet all of the performance requirements, the mattress shall include the following elements: quilted (see 6.3.6) upholstery, cushioning pad, insulator fabric, flange, tape, border, and innerspring core. Both sides of the mattress shall have identical construction.

3.3.1 Upholstery. The upholstery panel shall consist of durable flame resistant ticking stitched to the quilting foam with multi-needle quilting using a commercial quilt pattern. The ticking for each sleeping surface shall be cut in one piece without fabric splices (see 3.2.5).

3.3.2 Insulator fabric. The insulator fabric, which insulates the foam cushion topper from contact with the springs, shall completely cover the top and bottom of the coil assembly. The insulator fabric shall be attached to the spring unit every 4 to 6 inches around the perimeter.

3.3.3 Flange attachment. The flange shall be continuously stitched to one of the upholstery panels. This panel shall be placed over the foam pad and insulator fabric and attached to the sides every 4 to 6 inches around the perimeter of the mattress.

3.3.4 Tape. The tape shall be continuously stitched along the total length of each seam between the upholstery panels and the border, with no gaps or voids between the upholstery panel and border surfaces. The ends of the tape shall overlap a minimum of 1 inch with raw edges turned under ½ inch.

3.3.5 Border. The ticking for the mattress border shall be made of not more than two pieces of ticking with the ends spliced and sewn together in a continuous manner, leaving no breaks in uniformity and finish. The border shall be secured to the sleeping surfaces (see 6.3.8) of the mattress. The border shall be firmly stitched to the top and bottom quilted upholstery panels.

3.3.6 Seam and stitching. The stitch types shall conform to ASTM D6193. All seams shall be securely stitched. Seams shall not slip or pull out. All external stitching other than the quilted upholstery panel shall be 8 to 10 stitches per inch. The panel and border edges shall have ¾ to ½ inch seam allowances. Proper seam allowance and stitching shall be maintained to prevent raw edges, run-offs, twists, pleats, puckers, or open seams. Thread tension shall be maintained so there is no tight or loose stitching. All stitching shall be uniformly gauged throughout the panel and border edges. Thread breaks and ends of stitching not caught in another line of stitching shall be backstitched with a 301 stitch type at least ½ inch. All seams shall be formed with 301 or 401 stitch types. The quilted upholstery panel shall be eight stitches per inch.

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3.4 Labeling.

3.4.1 Identification and construction label. Each mattress shall have a combination identification, size, and instruction label. The label shall be tagged and the color of the inscription shall be black. The label shall be permanently attached to the ticking. The label shall be centered on the short end of the mattress and be attached beneath the tape on the side of the mattress to which the flange is attached. The label shall conform to the legal requirements of the state in which the mattress is manufactured. As a minimum, each mattress shall have a label showing the following information:

- a. Manufacturer's identification
- b. Contract or order number and date of manufacture
- c. Item name, specification number, and size number
- d. National Stock Number (NSN)
- e. Lot number

The lettering shall be permanent and legible. The instruction portion shall state the following: "Flame resistant treated ticking. Clean with mild, neutral pH detergent. Do not use harsh chemicals." This information shall be printed in bold capital letters a minimum height of no less than 0.125 inch.

3.4.2 Bar code label. Each mattress unit shall be individually bar-coded with a pressure sensitive label. The bar code element shall be a 13-digit NSN. There shall be a 12-digit Universal Product Code (UPC) assigned for all NSNs by the Government. The initials "UPC" shall appear beneath the code. The bar codes for NSN and UPC shall be a medium to high density, clearly legible and readable by scanner, and shall be located so that they are completely visible on the item when packaged as specified. Attachment of the label shall cause no damage to the mattress. The label shall be positioned on the outside of the plastic covering on the same end of the mattress that has the identification/instruction label in accordance with MIL-STD-129.

3.5 Physical requirements. Finished mattress dimensions and weights shall be as specified in [table II](#).

TABLE II. Finished mattress dimensions and weights.

| Size No. | Description | Length (inches) | Width (inches) | Depth (inches) | Maximum Weight (pounds) |
|------------|----------------------------------|-----------------|----------------|----------------|-------------------------|
| 1 | Crew (Short) | 72.5 | 26 | 4 | 25.8 |
| 2 | Crew (Regular) | 76 | 26 | 4 | 27.0 |
| 3 | Crew (Long) | 80 | 26 | 4 | 28.4 |
| 4 | CPO (Regular) / Officer (Narrow) | 76 | 28 | 5 | 33.0 |
| 5 | CPO (Long) | 80 | 28 | 5 | 35.0 |
| 6 | Crew Sub (Small) | 73 | 24 | 4 | 23.9 |
| 7 | Crew Sub (Regular) | 76 | 24 | 4 | 24.9 |
| 8 | Officer (Wide) | 76 | 34 | 5 | 41.5 |
| 9 | Officer/CPO Sub | 76 | 26 | 5 | 31.0 |
| Tolerances | | ±0.5 | +0.5; -0.25 | +0.625; -0.25 | |

3.6 Performance requirements. The finished mattress shall meet the performance characteristics identified in [table III](#) for fire resistance, firmness, and durability when subjected to verification methods identified in section 4.

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TABLE III. End item performance.

| Characteristic | Requirement |
|--|--|
| Fire resistance | a. Maximum net peak heat release ≤ 150 kW b. Average specific extinction area ≤ 162.75 yd ² /lb (300 m ² /kg) (see 4.5.3.1.2) c. No flaming droplets or flaming material ^{1/} |
| Firmness | Initial firmness rating of 75 ± 7.5 lbf ^{2/} at 25% compression |
| Durability | a. Permanent deformation $\leq 20\%$ of depth (pass/fail after 75,000 cycles) b. Retain structural integrity. After 75,000 cycles the visual and tactual examination shall indicate that the ticking is intact, with no evident seam failures or worn through areas; the cushioning shall not have any tactual indication of structural degradation of the foam; the springs shall not have any tactual indication of broken or dislocated springs; the springs shall not be tactually noticeable through the ticking |
| NOTES: ^{1/} This means no flaming droplets or flaming material, which fall from the test mattress during the fire test, shall continue flaming after reaching the test platform or floor. ^{2/} lbf is pound-force. | |

3.7 Protective temporary plastic covering. To keep the mattress clean and protect it from damage by liquids or other foreign matter, each mattress shall be completely sealed into a clear, medium density plastic bag no less than 3 mils in thickness (see 4.5.4). Air holes are permissible at one end of the bag to aid in removing excess air prior to sealing.

3.8 Toxicity.

3.8.1 Health hazard assessment (HHA) toxicity. When evaluated in accordance with 4.6.1 (the HHA), the finished mattress shall have no adverse effect on the health of personnel when used for its intended purpose (see 4.6.1 and 6.4).

3.8.2 Fire gas toxicity. The foam material shall be evaluated for types of gases and the toxicity levels released in accordance with 4.6.2.

3.9 Off-gassing. The finished mattress (sizes 6, 7, or 9 only) shall be evaluated for off-gassing in accordance with the requirements of 4.7. Based on the circumstances of use and the chemical nature of the mattress, the Navy will determine whether off-gas testing is required or if an administrative assessment is acceptable. In order to be considered acceptable for use in submarines, the mattress shall be assigned to either the "Permitted" or "Limited" category (see 4.7 and 6.5).

3.10 Workmanship. The finished mattress shall be clean and free from defects (cuts, holes, tears, stains, splicing, or repairs) and other conditions affecting form, fit, function, and appearance.

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).

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4.2 First article inspection. When specified (see 6.2), first article inspection of end item shall be accomplished in accordance with the inspection methods and criteria identified in [table IV](#) for mattresses. When specified (see 6.2), end item off-gas acceptance for size 6, 7, and 9 mattresses is required as part of first article inspection. Only one mattress from size 6, 7, or 9 (preferably size 6) shall be submitted from a single plant for Navy off-gas evaluation in accordance with 3.9. No future end item off-gas acceptance is required provided mattress composition, components, and materials remain identical to the Navy mattress accepted for off-gas. When specified (see 6.2), HHA toxicity and fire gas toxicity shall be evaluated (see 3.8.1, 3.8.2, 4.6.1, and 4.6.2). No future HHA toxicity evaluation is required provided mattress composition, components, and materials remain identical to the Navy mattress accepted for toxicity.

TABLE IV. Component and end item examination and tests.

| Test Item | Characteristic | Requirement | Examination/Test Method |
|--|------------------------------------|-------------------------|-----------------------------------|
| Component and Material Inspection | | | |
| Upholstery ticking, Border ticking | Tear strength | table I | ASTM D1424 |
| | Breaking strength | table I | ASTM D5034 |
| | Fabric weight | table I | ASTM D3776/D3776M |
| Quilting foam | Density | 3.2.5.1 | 4.5.1.b |
| | Compression set | 3.2.5.2 | 4.5.1.d |
| | Tensile strength | 3.2.5.3 | 4.5.1.e |
| Cushioning pad | Thickness | 3.2.7.1 | 4.5.1.a |
| | Density | 3.2.7.2 | 4.5.1.b |
| | Indentation force deflection (IFD) | 3.2.7.3 | 4.5.1.c |
| | Compression set | 3.2.7.4 | 4.5.1.d |
| | Tensile strength | 3.2.7.5 | 4.5.1.e |
| | Tear strength | 3.2.7.6 | 4.5.1.f |
| | Resilience | 3.2.7.7 | 4.5.1.g |
| | Dry heat aging | 3.2.7.8 | 4.5.1.h |
| Component Flammability Performance Characteristics | | | |
| Upholstery ticking ^{2/} , border ticking ^{2/} , insulator fabric, flange, tape ^{1/} | Char length | table I | ASTM D6413/D6413M |
| | After flame | table I | ASTM D6413/D6413M |
| | Molten or flaming drops | table I | ASTM D6413/D6413M |
| Cushioning pad, and quilting foam | Molten or flaming drops | table I | ASTM E162/ASTM E662 ^{3/} |
| | Flame spread index | table I | ASTM E162 |
| | Smoke density, D _{MAX} | table I | ASTM E662 ^{3/} |
| | Fire gas toxicity | 3.8.2 | 4.6.2 |

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TABLE IV. Component and end item examination and tests – Continued.

| Test Item | Characteristic | Requirement | Examination/Test Method |
|--|-----------------|---------------------------|-------------------------|
| End Item Performance Characteristics | | | |
| Mattress | Dimensions | table II | 4.5.2.1 |
| | Weight | table II | 4.5.2.2 |
| | Firmness | table III | 4.5.3.2 |
| | Durability | table III | 4.5.3.3 |
| | Workmanship | 3.10 | 4.5.5 |
| | Fire resistance | table III | 4.5.3.1 |
| NOTES: | | | |
| ^{1/} The only flammability requirement that applies to the tape is for molten or flaming drops. | | | |
| ^{2/} Fire test requirements for ticking fabric shall apply to initial flammability and flammability after 15 launderings. | | | |
| ^{3/} Testing shall be conducted in both flaming and non-flaming modes. | | | |

4.2.1 **First article units.** The mattresses selected as sample units from the first article lot shall be thoroughly checked for all mattress requirements in [table IV](#) and herein (see 6.2). The sample shall be representative of the construction, workmanship, components, and materials to be used during production. The sampling rate shall be as specified in 4.4.

4.3 **Conformance inspection.** Conformance inspection shall include the inspections of 4.3.1 through 4.3.2.

4.3.1 **In-process examination.** Visual examinations shall be made during the manufacture of the mattress to ensure construction details are in accordance with the requirements specified in section 3. Examinations shall be made prior to the final closing of the mattress where such details cannot be examined after final mattress closure. Dimensional and labeling examinations shall be made after final closure of the mattress. Materials and components that can be classified as a defect in accordance with [tables IV](#) and [V](#) shall be removed from production.

4.3.2 **Inspection of end item.** The end item inspection shall be in accordance with [table IV](#). A failure of any sample shall constitute a failure of the entire lot.

4.3.3 **Lot.** A lot shall consist of all units of the same type that are produced under similar conditions and are ready for inspection or shipment at one time. Unless otherwise specified (see 6.2), the lot size shall be expressed in the number of finished mattresses.

4.4 **Sampling.**

4.4.1 **Sampling for inspection of first article and end item.** Samples, consisting of finished mattresses and components, shall be randomly selected from each lot. Except for durability testing (see 4.4.2), the sampling rate shall be 3 units on lots of 1 to 250, 5 units on lots of 251 to 1,200, 7 units on lots of 1,201 to 10,000, and 10 units on lots from 10,001 to 35,000. The inspections shall be as specified in 4.2.1 for first article and 4.3.1 and 4.3.2 for end item.

4.4.2 **Sampling for durability testing.** A single mattress shall be selected from each lot. For each depth of mattress, one sample unit shall be tested. The test sample shall be marked with an “X” on the label. For those plants producing mattresses of only a single depth, an additional mattress shall be provided to be used as part of the test apparatus to accommodate the translation of the rollator beyond the width of the test sample unit. However, the additional mattress shall neither be tested nor evaluated as a sample test unit.

4.4.3 **Test sample preparation.** Unless otherwise specified (see 6.2), samples for individual tests shall be prepared in accordance with the specified test method.

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4.5 Inspection methods.

4.5.1 Foam performance testing. Foam performance testing shall be performed in accordance with ASTM D3574 as follows:

- a. Thickness. Foam thickness shall be determined by placing the foam on a flat surface and taking thickness measurements in accordance with Measurement of Test Specimens at a point approximately 3 inches in from the sides and end of the foam at each of the four corners.
- b. Density. Foam density shall be determined in accordance with the Density test.
- c. IFD. Foam IFD shall be determined in accordance with the Indentation Force Deflection Test—Specified Deflection test for a specified deflection of 25 percent. The sample size shall be 15 inches by 15 inches by 4 inches thick.
- d. Compression set. Foam compression set shall be determined in accordance with the Constant Deflection Compression Set test.
- e. Tensile strength. The tensile strength of the foam shall be tested in accordance with the Tensile test.
- f. Tear strength. The tear strength of the foam shall be tested in accordance with the Tear Resistance test.
- g. Resilience. The resilience of the foam shall be determined in accordance with the Resilience (Ball Rebound) test.
- h. Dry heat aging. The dry heat aging properties of the foam shall be determined in accordance with the Dry Heat Aging test and evaluated with the before and after test results of the IFD test.

4.5.2 Verification of physical requirements. The physical requirements of the finished mattress for each size shall be inspected in accordance with this specification.

4.5.2.1 Dimensions. The finished mattress samples shall be placed on a flat and level surface for verification of the specified length, width, and depth. Depth measurements shall be taken at a point approximately 3 inches in from the sides and ends of the mattress at each corner. Depth shall be taken as the average of measurements taken at each of the four corners of the mattress. The mattress samples shall be measured for length by measuring at three locations along the width and averaging the three dimensions. Similarly, the width shall be measured as the average of three measurements taken along the length of the mattress. Length and width measurements shall be made between tape stitch lines. See [figure 1](#) for locations of length, width, and depth measurements (see 3.5).

4.5.2.2 Weight. The weight of the mattress shall be measured in accordance with standard commercial practice using a load cell with a resolution of 0.25 pound (0.1 kilogram) or less.

4.5.3 Verification of performance requirements. The finished mattress samples shall be tested for fire resistance, firmness, and durability in accordance with the performance requirements of this specification.

4.5.3.1 Fire performance. The mattress samples shall be tested in accordance with ASTM E1590, including all optional results, with the exceptions noted in 4.5.3.1.1. Any failure shall be cause for rejection of the lot. The sampling rate for the fire testing shall be as specified in 4.4.1.

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4.5.3.1.1 Test exceptions.

a. The full-sized test sample shall be mounted label side up on an open frame bunk or support system that will allow direct flame impingement to the bottom surface and sides of the mattress by the ignition source. The welded bed frame shall conform to [figure 2](#).

b. ASTM E1590, Test Configuration C shall be used. As specified (see 6.2), the report required by ASTM E1590 shall include all optional results identified in the Reports section.

c. The “T” burner described in the Ignition Source section of ASTM E1590 shall be replaced with a burner as shown on [figure 3](#), having a nominal 12 by 12 inch top surface. The burner shall have a minimum 4-inch layer of silica sand, 0.08 inch (2 millimeters) to 0.12 inch (3 millimeters) in size, to provide the horizontal surface through which the gas is supplied. The sand layer shall be flush with the top of the burner.

d. The burner shall be positioned such that the top edge of the burner is 15 inches \pm 0.5 inch below the bottom edge of the test specimen and centered with respect to the long side of the test specimen with half of the width of the burner under the mattress as shown on [figure 4](#).

e. The test specimen shall be exposed to a fire producing a total heat output of 50 kilowatts (kW) \pm 3 kW for the first 5 minutes of the test, followed by an increase to 100 kW \pm 5 kW for an additional 10 minutes. The total fire exposure time shall be 15 minutes.

f. Measurements for carbon monoxide (CO) and carbon dioxide (CO₂) shall also be made.

g. The burner shall be turned off. Combustion shall be allowed to continue until one or more of the following conditions are reached:

- (1) All flaming combustion has ceased.
- (2) 30 minutes have elapsed from the time the burner was ignited.

4.5.3.1.2 Average specific extinction area. Average specific extinction area (yd²/lb [m²/kg]) is defined as the total smoke released (y² [m²]) divided by the total mass loss (lb [kg]).

4.5.3.1.3 Fire testing provisions. All fire tests specified in this document shall be conducted by an independent testing laboratory that is accredited to ISO/IEC 17025 and is approved by the NAVSEA Technical Authority. Accreditation shall be obtained from a recognized accreditation body such as American Association for Laboratory Accreditation (A2LA) or International Code Council’s International Accreditation Services (IAS). The scope of accreditation shall include specific flammability and fire tests. All other fire test provisions shall be as specified (see 6.2 and 6.6).

4.5.3.2 Firmness testing. The firmness rating shall be determined by using the equipment as specified in ASTM F1566 and following the procedure as specified in the Firmness Rating, Mattress or Mattress Set, or Both section, except that the firmness rating shall be the force required to achieve a 25 percent deflection of the mattress.

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4.5.3.3 Durability testing. The mattress shall be tested in accordance with the Durability Test for Mattress or Mattress Set, or Both section described by ASTM F1566, with the exceptions noted in 4.5.3.3.1.

4.5.3.3.1 Test exceptions. Test exceptions shall be as follows:

a. As the firmness rating has already been determined, it is not necessary to repeat.

b. The test duration is not 100,000 cycles, but is performed in blocks of 25,000 cycles as follows:

(1) Stop at 25,000 cycles. Inspect for any signs of wear, tear, damage, or degradation on any part of the mattress in accordance with the following:

- (a) Visually inspect the condition of the ticking.
- (b) Tactually inspect the condition of the cushioning.
- (c) Tactually check if springs are noticeable through the cushion material.
- (d) Tactually inspect the condition of the springs.
- (e) Take pictures of any problems that can be seen visually.

(2) Stop at 50,000 cycles.

(a) Allow mattress to recover for 60 ± 1 minutes. Measure the height and by comparing to the initial height, determine the percent permanent deformation for pass/fail.

(b) Inspect for any signs of wear, tear, damage, or degradation on any part of the mattress in accordance with the following:

- 1 Visually inspect the condition of the ticking.
- 2 Tactually inspect the condition of the cushioning.
- 3 Tactually check if springs are noticeable through the cushion material.
- 4 Tactually inspect the condition of the springs.
- 5 Take pictures of any problems that can be seen visually.

(3) Stop at 75,000 cycles.

(a) Allow mattress to recover for 60 ± 1 minutes. Measure the height and by comparing to the initial height, determine the percent permanent deformation for pass/fail.

(b) Inspect for any signs of wear, tear, damage, or degradation on any part of the mattress in accordance with the following:

- 1 Visually inspect the condition of the ticking.
- 2 Tactually inspect the condition of the cushioning.
- 3 Tactually check if springs are noticeable through the cushion material.
- 4 Tactually inspect the condition of the springs.
- 5 Take pictures of any problems that can be seen visually.

4.5.4 Protective temporary plastic covering. The thickness of the temporary plastic covering shall be determined in accordance with ASTM D6988.

4.5.5 Workmanship inspections. Visual inspections shall be conducted to check for any manufacturing defects in the finished mattress. The finished mattress shall be clean and free from defects in accordance with 3.10 and [table V](#) and other conditions affecting form, fit, function, and appearance. Failure of a major defect shall constitute a failure of the entire lot. If there is a failure of a minor defect, then sample mattresses that failed this inspection shall be removed from the production run and a second set of samples selected. Failure of this second set of samples shall result in failure of the lot.

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TABLE V. Manufacturing defects.

| Defect Category | Characteristic | Defects | |
|-----------------|---|---|---|
| Critical | | | |
| 1 | Protective Temporary Plastic Covering | Cover omitted. | |
| Major | | | |
| 101 | Dimensions | Innerspring core length, width, or depth extends beyond the finished mattress or recedes from the finished mattress greater than allowed in 3.5 and table II . | |
| 102 | | Mattress not in accordance with 3.5 and table II . | |
| 103 | Weight | Mattress exceeding maximum weight specified in 3.5 and table II . | |
| 104 | Material | Incorrect or unapproved material used. | |
| 105 | | Mattress has objectionable odor. | |
| 106 | Ticking | Broken or missing yarns: <ul style="list-style-type: none"> a. Three or more contiguous, regardless of length. b. Two contiguous, 2 inches or more in length. | |
| 107 | | Any hole, cut, tear, or smash (see 6.3.7). | |
| 108 | | Any mend or patch. | |
| 109 | | Thin or open place. | |
| 110 | | Floats or skips – multiple ½ inch in combined warp and filling directions. | |
| 111 | | Light place or fine filling bar, clearly noticeable. | |
| 112 | | Any open seam. | |
| 113 | | Raw edges over 1 inch in length. | |
| 114 | | Construction | Design and construction of the finished mattress not as specified in section 3. |
| 115 | | | Springs not completely filled in the mattress. |
| 116 | Mattress ends have loose, sagging appearance; spring unit not evenly distributed such that the mattress exterior appears warped or twisted; clearly noticeable lumps; and corner(s) not firm, indicating a defective spring unit. | | |
| 117 | Stitch type and stitches per inch not as specified; needle chew or needle cutting; end of stitching when not caught in another seam; broken stitch not repaired as specified; open seam, skipped or run-off stitches, raw edges. | | |
| 118 | Seam allowances not as specified; loose or tight tension; badly pleated, caught or twisted in any unrelated row of stitching as specified in 3.3.6. | | |
| 119 | Thread breaks and ends of stitching not caught in another line of stitching, backstitched less than ½ inch. | | |
| 120 | Thread type not as specified. | | |
| 121 | Tape omitted. | | |
| 122 | Component parts omitted or not as specified. | | |
| 123 | Hard spot or large lump which can be felt through tick. | | |

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4.6 Toxicity.

4.6.1 HHA toxicity. An HHA will be conducted to ensure conformance to 3.8.1, as specified (see 6.2). The Navy and Marine Corps Public Health Center (NMCPHC) will evaluate the mattress using data provided by the manufacturer/distributor to the NMCPHC (see 3.8.1 and 6.4).

4.6.2 Fire gas toxicity. During the conduct of the smoke density test specified in 3.8.2, the foam material shall be evaluated for fire gas toxicity in accordance with ASTM E800. The average value of the maximum value of the gas concentration measured at each condition (flaming and non-flaming) shall be recorded for the following gases: carbon monoxide (CO); hydrogen chloride (HCl); hydrogen fluoride (HF); nitrogen oxides (NOx); hydrogen bromide (HBr); hydrogen cyanide (HCN); and sulfur dioxide (SO₂), as specified (see 6.2). When making toxicity measurements, the sampling of gases shall be made during the testing of the second and the third specimen at each test condition, from the geometrical center of the chamber at the time when the maximum specific optical density of smoke is reached. The number of samples shall be four; two each in the flaming and non-flaming condition. The concentration of each toxic gas shall be determined as parts per million (ppm) in the chamber volume.

4.7 Off-gassing. The mattress shall be evaluated for off-gassing in accordance with S9510-AB-ATM-010 chapter titled "Material Control Program" (see 3.9 and 6.5). If the Navy determines that off-gas testing is required, testing shall be conducted at a NAVSEA approved test facility (see 3.9). The Navy will review the off-gas test results and assign a usage category. Additionally, the Navy will assign a usage category if an administrative review is conducted in lieu of off-gas testing (see 3.9).

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 commands. 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 mattresses covered by this specification are intended for use aboard U.S. Navy vessels. Due to extensive testing and approvals needed, end users should always procure through the NSN system.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Size required (see 1.2).
- c. The specific issue of individual documents referenced (see 2.2.1, 2.2.2, and 2.3).
- d. When first article inspection/testing is required (see 3.1 and 4.2).
- e. Requirements for an HHA (see 3.8.1, 4.2, and 4.6.1).
- f. Requirements for fire gas toxicity (see 3.8.2, 4.2, 4.6.2, and 6.9).
- g. When off-gas testing is required (see 3.9, 4.2, 4.7, and 6.5).
- h. Test sample preparation (see 4.4.3).
- i. Requirement for a test report, including all optional results, in accordance with ASTM E1590 (see 4.5.3.1.1.b).
- j. Additional fire testing provisions (see 4.5.3.1.3 and 6.6).
- k. Packaging requirements (see 5.1).
- l. When review of MSDS, spread sheet (component quantity [weight] and location in mattress), and samples of each component are required (see 6.4).

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m. Where certificates of compliance are acceptable (see 6.7).

6.3 Definitions. The following definitions, adopted from the Code of Federal Regulations - Title 16, Volume 2, Part 1632, with modifications, apply for the purpose of this specification.

6.3.1 Border. Border is the material, made from ticking fabric, that forms the side panel surrounding the perimeter of the mattress and defines its depth.

6.3.2 Core. Core is the main support system that may be present in a mattress, such as springs, foam, or resilient filling.

6.3.3 Cushioning pad. Cushioning pad is one or more layers of a cushioning system between the upholstery and mattress core consisting of synthetic flexible foam.

6.3.4 Flange. Flange is a strip of material secured to the perimeter of an upholstery panel to secure to the innerspring core.

6.3.5 Mattress. Mattress is a ticking filled with a resilient material such as synthetic flexible foam or innerspring unit used alone or in combination with other products intended or promoted for sleeping upon.

6.3.6 Quilted. Quilted is stitched with thread or by fusion through the ticking and one or more layers of upholstery material.

6.3.7 Smash. Smash is a relatively large hole in fabric characterized by broken warp ends and floating picks.

6.3.8 Surface. Surface is one side of a mattress that can be tested.

6.3.9 Tape edge. Tape edge is the seam or border edge of a mattress.

6.3.10 Ticking. Ticking is the outermost layer of fabric or related material that encloses the core and upholstery materials of a mattress or mattress pad.

6.3.11 Upholstery. Upholstery, either loose or attached, includes the ticking and one or more layers of a cushioning system.

6.4 HHA toxicity evaluation. The NMCPHC requires sufficient information to permit an HHA of the product. Upon completion of the HHA, a copy will be provided by the NMCPHC to the Government for evaluation. The HHA process is described on the NMCPHC's website, <http://www.med.navy.mil/sites/nmcpHC/industrial-hygiene/Pages/health-hazard-assessment.aspx>.

6.5 Material certification. Materials to be installed in submarines are to be controlled to prevent off-gassing, which contaminates the submarine's atmosphere and can result in health hazards to personnel or deleterious effects on machinery. These controls are administered through the Submarine Material Control Program, which is described in the Nuclear Powered Submarine Atmosphere Control Manual, S9510-AB-ATM-010 chapter titled "Material Control Program." 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 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to CommandStandards@navy.mil. The certification request is accompanied by detailed information, including descriptions of the material, method of application, usage, and storage. A chemical analysis is conducted, which can be accomplished through off-gas testing. If off-gas testing is required, it must be conducted in a Government approved laboratory. Information pertaining to this test requirement may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to CommandStandards@navy.mil. 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.

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6.6 Additional fire testing provisions. NAVSEA reserves the right to witness the tests, and perform any of the tests set forth herein where such testing is deemed necessary to assure compliance to prescribed requirements. NAVSEA will provide a letter that indicates the approved laboratories which are accredited to ISO/IEC 17025 and which details how to obtain and maintain accreditation (see 6.2).

6.7 Certificate of compliance. Where certificates of compliance are submitted (see 6.2), the Government reserves the right to test such items to determine the validity of the certification. The supplier is permitted to provide a certificate of compliance for each component. The supplier must attach to the certificate of compliance the passing test reports that identify the test results required for each component ([table I](#)), and provide them to the end item producer. Each certificate of compliance must be made available to the Government representative.

6.8 Equivalent material requests. Requests to use equivalent materials should be sent to the contracting officer for approval by the Navy. Any changes to component materials occurring after initial first article inspection should be evaluated to the requirements of [table I](#) and requires approval by NAVSEA.

6.9 Fire gas toxicity evaluation. NAVSEA recommends inclusion of the fire gas toxicity evaluation (see 3.8.2 and 4.6.2). Measurement of the concentration of each toxic gas should be as prescribed in 4.6.2 and provided in the first article test report (see 6.2). The Navy will use the data provided for evaluation purposes.

6.10 Subject term (key word) listing.

Border

Core

Cushioning

Fire performance

Flange

Insulator

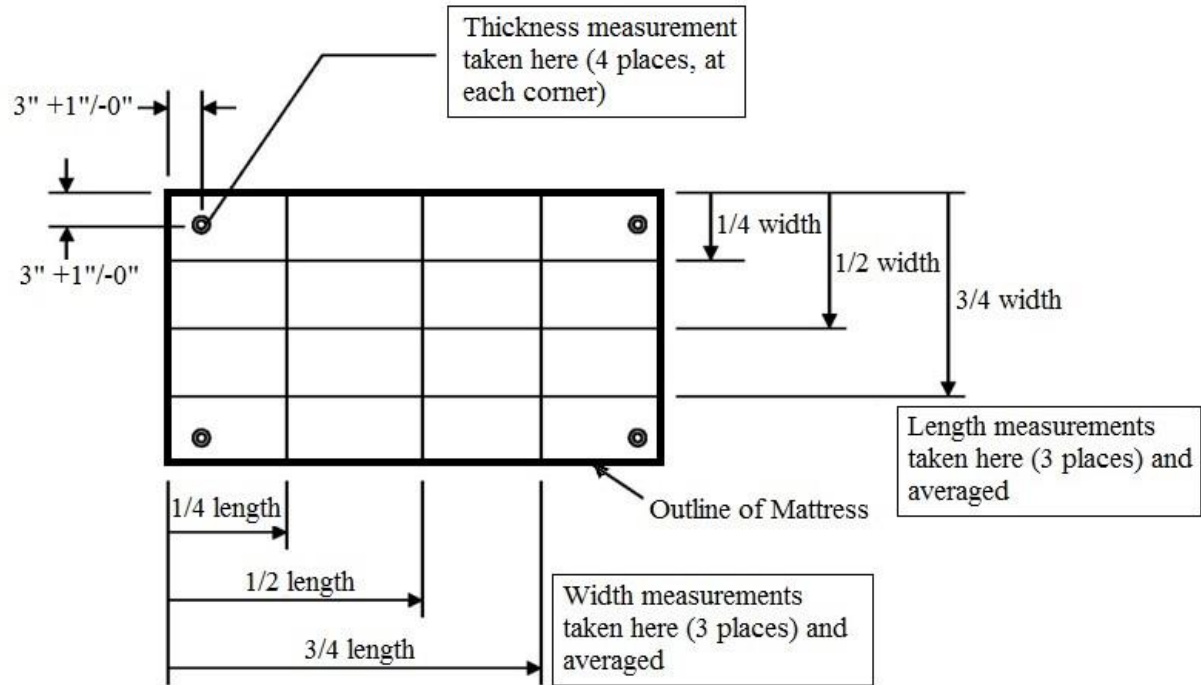
Quilting

Tape

Ticking

Upholstery

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NOTE:

1. The tolerance for locations of the length and width measurements is ± 1 inch.

FIGURE 1. Test specimen dimensional measurement locations.

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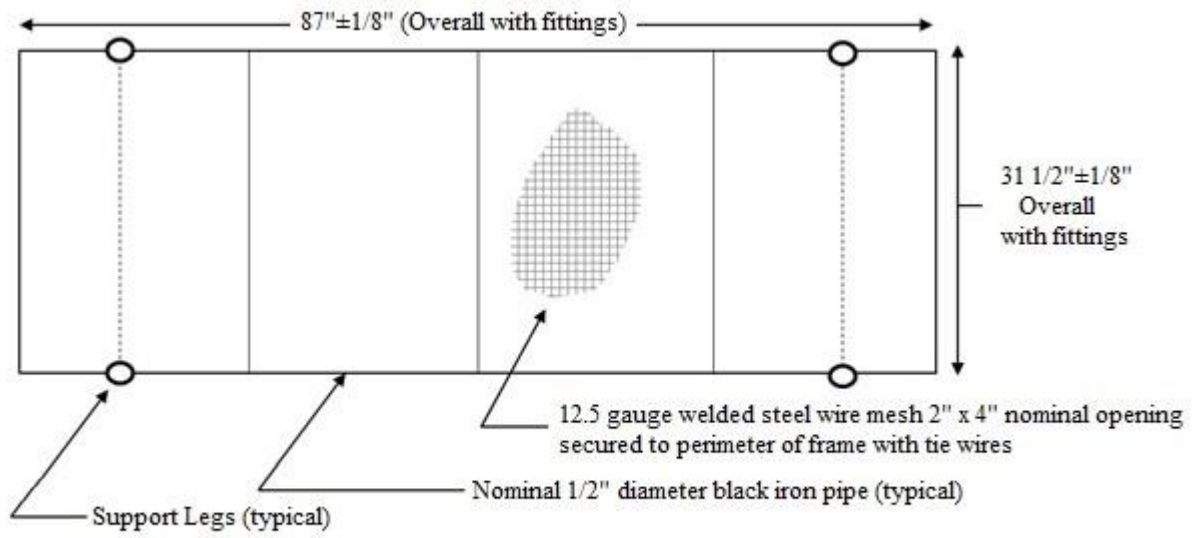
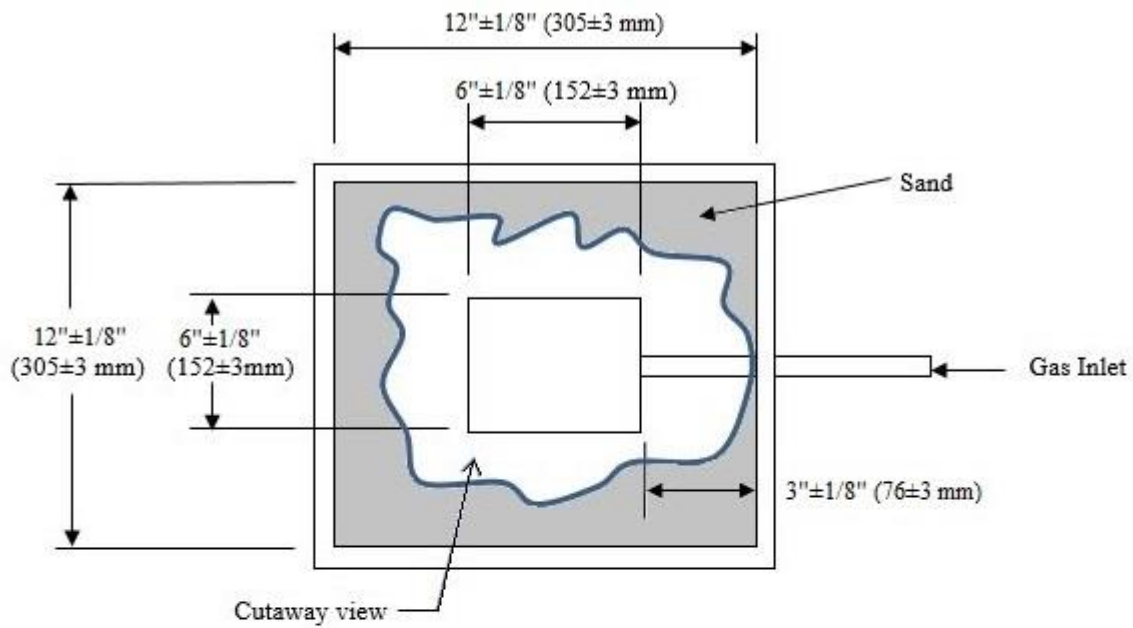
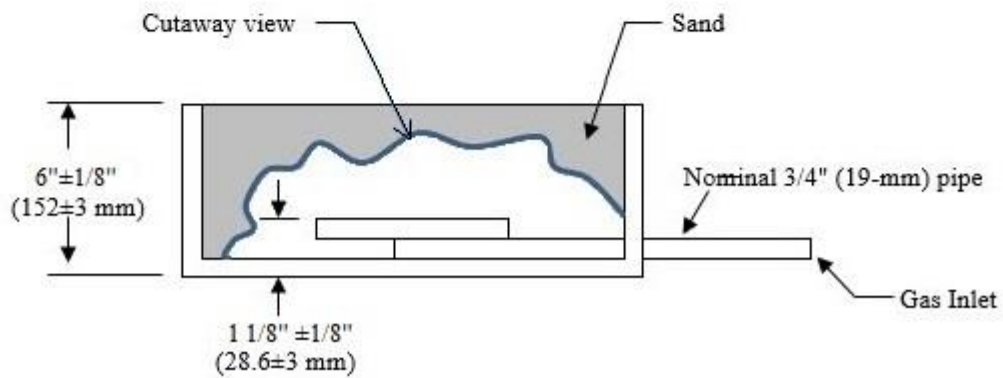
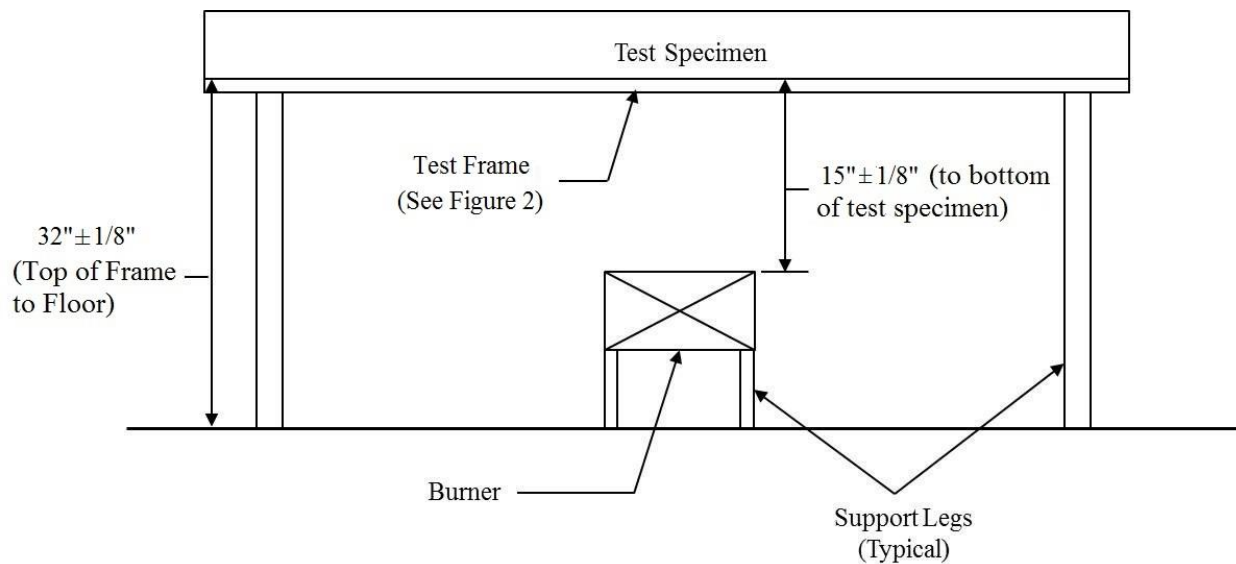


FIGURE 2. Test sample bed frame.

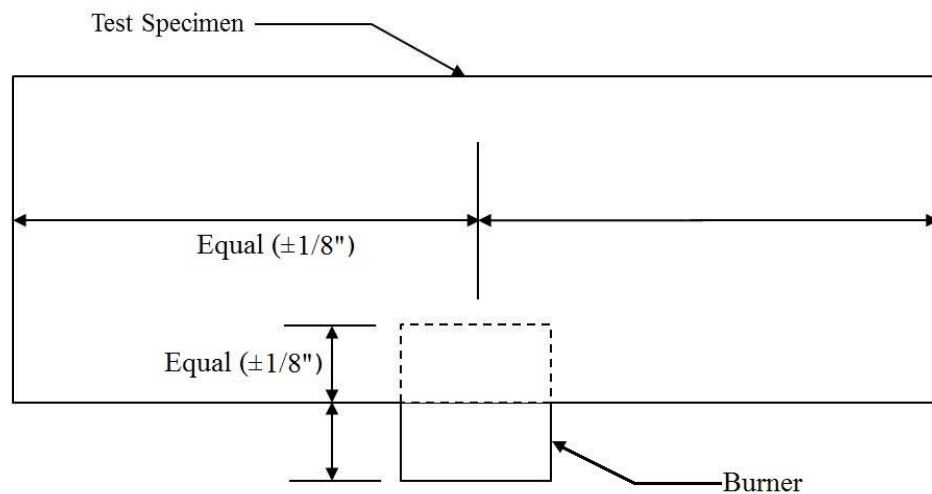
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**TOP VIEW****SIDE VIEW**FIGURE 3. Gas burner.

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ELEVATION VIEW OF TEST SPECIMEN & BURNER



PLAN VIEW OF TEST SPECIMEN & BURNER

FIGURE 4. Test specimen and burner layout.

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Custodians:

Army – GL
Navy – SH
Air Force – 11

Preparing activity:

Navy – SH
(Project 7210-2013-002)

Review activities:

Army – MI
Navy – CG, NU
DLA – CT

Civil agency:

GSA – FAS

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 <https://assist.dla.mil>.