



# Standard Specification for Mattress and Box Springs for Use in Berths in Marine Vessels<sup>1</sup>

This standard is issued under the fixed designation F 1085; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification provides the requirements for mattresses and box springs that are for use in berths for officers, crew, and passengers in marine vessels. This shall be considered a minimum standard.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses, in inch-pound units, are for information only.

1.3 *This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire conditions.*

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- D 123 Terminology Relating to Textiles
- D 1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum Type (Elmendorf) Apparatus
- D 3574 Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams
- D 3951 Practice for Commercial Packaging
- D 5034 Test Method for Breaking Strength and Elongation

of Textile Fabrics (Grab Test)

- D 6193 Practice for Stitches and Seams
- D 6413 Test Method for Flame Resistance of Textiles (Vertical Test)
- E 162 Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
- E 176 Terminology of Fire Standards
- E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- E 1354 Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- F 1566 Test Methods for Evaluation of Innersprings and Box Springs
- E 1590 Test Method for Fire Testing of Mattresses

### 2.2 ANSI Standards:<sup>3</sup>

- ANSI Z357.1-1981 American National Standard for Bedding Products and Components
- ANSI/ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

### 2.3 California Bureau of Home Furnishings and Thermal Insulation Standard:

- CA Technical Bulletin 129, (CA TB 129) Flammability Test Procedure for Mattresses for Use in Public Buildings—October 1992<sup>4</sup>

### 2.4 Federal Standards:

- Code of Federal Regulations Title 16, Vol 2, Part 1632<sup>5</sup>
- Purchase Description—Mattress—Innerspring, Flame-Resistant, Shipboard—NAVSEA 05L PD 4-02 (May 2002)<sup>6</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.03 on Outfitting and Deck Machinery.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

<sup>4</sup> Available from California Bureau of Home Furnishings and Thermal Insulation, 3483 Orange Grove Ave., North Highlands, CA 95660.

<sup>5</sup> Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SSOP, Washington, DC 20402-9328.

<sup>6</sup> Available from NAVSEA, Naval Sea Systems Command, Dept. of Navy, 1333 Isaac Hull Ave., STOP 5149 (SEA 05P6), Washington Navy Yard, DC 20376-5149.

## 2.5 NFPA Standard:

NFPA 301 Code for Safety to Life from Fire on Merchant Vessels<sup>7</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification associated with textiles, see Terminology D 123. For definitions of terms used in this specification associated with fire issues, see Terminology E 176.

#### 3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *border, n*—a material that forms the side panel that surrounds the perimeter of the mattress and defines its depth.

3.2.2 *box spring, n*—a foundation for a mattress, consisting of wire spring elements mounted on a frame, generally upholstered and covered on the top and sides with ticking, and on the bottom with a dust cover.

3.2.3 *box spring assembly, n*—an interconnection of coil springs, border wire, and top wire assembly contained within a box spring.

3.2.4 *flaming droplets, n*—flaming molten or flaming liquefied droplets which fall from the test specimen during the fire test and continue to burn.

3.2.5 *flange, n*—strip of material secured to the perimeter of an upholstery panel to secure to the innerspring core.

3.2.6 *innerspring unit, n*—an interconnection of wire spring elements other than mounting on a frame that forms a single unit that can be incorporated into a mattress.

3.2.7 *insulator pad, n*—one or more layers of a cushioning system between the upholstery and mattress core, which consist of foam or other cushioning or filling materials.

3.2.8 *mattress, n*—ticking filled with a resilient material used alone or in combination with other products intended or promoted for sleeping upon.

3.2.9 *mattress core, n*—the main support system that may be present in a mattress, such as springs, foam, or resilient filling.

3.2.10 *mattress, innerspring, n*—any mattress containing an innerspring unit.

3.2.11 *mattress, solid core, n*—any mattress containing padding, but not an innerspring unit.

3.2.12 *quilted, adj*—stitched with any thread or by fusion through the ticking and one or more layers of upholstery material.

3.2.13 *tape edge, n*—seam or border edge of a mattress.

3.2.14 *ticking, n*—the outermost layer of fabric or related material that encloses the core and upholstery materials of a mattress or mattress pad.

### 4. Ordering Information

4.1 Orders for items purchased under this specification shall define the following:

4.1.1 *Mattresses*—Quantity, dimensional requirements, type (solid core or innerspring), and weight per each size.

4.1.2 *Box Springs*—Quantity, dimensional requirements, and weight per each size.

4.1.3 Upholstery material selections are to be offered as choices by the manufacturer or distributor to the purchaser. The selection shall be of good quality suitable for commercial use and for use aboard U.S. Navy vessels.

4.1.4 When first article of inspection is required, it shall be spelled out in the paperwork.

### 5. Materials and Manufacture

5.1 *Innerspring Mattress*—The essential components of an innerspring mattress are: an innerspring core, cushioning, upholstery ticking (either quilted or with a smooth top, and potentially including a flange), and a border. Optional components include various insulating layers or pads, flanges, and tapes. All materials used shall meet the mechanical property and fire performance requirements of Table 1. All materials used shall comply with appropriate commercial bedding industry standards of manufacture and durability. Any construction of an innerspring mattress that is suitable for its intended use and that complies with the performance requirements shown herein shall be permitted to be used.

5.1.1 *Innerspring Core*—The innerspring core shall be constructed from an all-wire carbon steel. The coils shall extend the full length and width of the mattress. The coils shall be permanently secured to provide long-term structural stability. Various core designs shall be permitted. The support properties of the innerspring core, in terms of firmness rating, durability, resistance to impact, firmness retention, and surface deformation, shall be assessed by Test Methods F 1566. The coils, or the complete spring unit assembly, shall be given suitable thermal treatment to relieve residual stresses caused by coiling.

5.1.2 *Cushioning and Insulator Layers*—An insulator pad shall be placed over each sleeping surface of the innerspring core to insulate the upholstery from the core. The various cushioning layers shall be constructed of materials that meet the performance requirements of Table 1.

5.1.3 *Ticking and Cover Assembly*—The cover construction shall be suitable for the type of mattress construction used. Upholstery ticking materials shall be durable, per common bedding industry practices. The ticking for each sleeping surface shall be cut in one piece without fabric splices. 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 gaps or voids in uniformity and finish. The border assembly shall be secured to the top and bottom sleeping surfaces of the mattress, by automatic sewing, per common bedding industry practices.

5.1.4 *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 gaps or voids in uniformity and finish. The border assembly shall be secured to the top and bottom sleeping surfaces of the mattress, by automatic sewing, per common bedding industry practices.

5.1.5 *Tape*—A tape shall be permitted to be used to conceal the seams formed between the border, if present, and an upholstery panel. The tape shall be continuously stitched along the total length of each seam, with no gaps or voids between the upholstery panel and border surfaces.

<sup>7</sup> Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

**TABLE 1 Mattress Component Requirements**

Component	Characteristic	Requirement	Test Method
Upholstery Ticking (and Flange, Tape, and Pocketing Materials, if used) (Notes 1 and 2)	Initial Flammability		
	Char Length	≤127 mm (5.0 in.)	Test Method D 6413
	After Flame	≤2.0 s	Test Method D 6413
	No Flaming Droplets		Test Method D 6413
	Flammability after 15 Launderings		
	Char Length	≤127 mm (5.0 in.)	Test Method D 6413
	After Flame	≤2.0 s	Test Method D 6413
	No Flaming Droplets		Test Method D 6413
	Other Properties		
	Tear Strength (Note 3)	Warp: 1.6 kg (3.5 lb) min; Filling: 1.6 kg (3.5 lb) min	Test Method D 1424
Breaking Strength (Note 3)	Warp: 42.6 kg (94 lb) min; Filling: 26.3 kg (58 lb) min	Test Method D 5034	
Border Ticking	Flammability		
	Char Length	≤38 mm (1.5 in.)	Test Method D 6413
	After Flame	≤2.0 s	Test Method D 6413
	No Flaming Droplets		Test Method D 6413
	D <sub>MAX</sub>	50	Test Method E 662
	D <sub>MAX</sub>	No Flaming Droplets	Test Method E 662
	Other Properties		
	Tear Strength	Warp: 1.8 kg (4 lb) min; Filling: 1.8 kg (4 lb) min	Test Method D 1424
Breaking Strength	Warp: 42.6 kg (94 lb) min; Filling: 22.7 kg (50 lb) min	Test Method D 5034	
Cushioning and Insulator Layers	Flammability		
	Char Length	≤127 mm (5.0 in.)	Test Method D 6413
	After Flame	≤2.0 s	Test Method D 6413
	No Flaming Droplets		Test Method D 6413
	Flame Spread (I <sub>s</sub> ) (Note 4)	10	Test Method E 162
	D <sub>MAX</sub> (Note 4)	200	Test Method E 662
	D <sub>MAX</sub> (Note 4)	No Flaming Droplets	Test Method E 662
	Other Properties		
	Dry Heat Aging / Compression Force Deflection	No more than 20 % change in compression force deflection	Test Method D 3574, Methods C and K

NOTE 1—Only Molten and/or Flaming Droplets requirement applies to Tape.

NOTE 2—Only Initial Flammability requirements apply to Pocketing Material.

NOTE 3—Tear Strength and Breaking Strength apply only to Upholstery Ticking.

NOTE 4—When materials are not identical on both sides, each side shall be tested as a different specimen.

5.1.6 *Seam and Stitching*—The seam and stitch types shall be in accordance with Practice D 6193. All seams shall be securely stitched. Seams shall not slip or pull out.

5.1.7 *Mattress*—All mattress components shall meet the requirements of Table 1, as appropriate. The overall mattress shall meet the performance requirements of Table 2, as

**TABLE 2 Full Mattress Requirements**

Characteristics	Requirement	Test Method
Fire Performance Characteristics		
Minimum	a. Maximum Rate of Heat Release ≤100 kW	Test Method E 1590
	b. Maximum Total Heat Release in first 10 min of test ≤25 MJ	Test Method E 1590
	c. Maximum Mass Loss in the first 10 min of test ≤1.4 kg (3 lb)	Test Method E 1590
	d. Class A Pass	16 CFR 1632
Optional (US Navy Requirement)	a. Maximum Rate of Heat Release ≤150 kW	Annex A1
	b. Maximum Average Specific Extinction Area <300 m <sup>2</sup> /kg	Annex A1
	c. No Flaming Droplets	Annex A1
Physical Characteristics		
Durability (Rollator Test)	a. Firmness Rating of 330 N (75 lbf) ± 10 %, after 100 000 cycles	Test Method F 1566, Section 7
	b. Permanent Deformation ≤20 % of depth	Test Method F 1566, Section 7
	c. No Damage	Test Method F 1566, Section 7
Firmness Retention and Surface Deformation (Cornell Test)	a. Accumulated Dimple ≤44.5 mm (1.75 in.)	Test Method F 1566, Section 9
	b. Support Firmness Change ≤(+ 40 %) - (-15 %)	Test Method F 1566, Section 9
Dimensions	See Section 6	
Weight	See Section 6	
Visual Characteristics		
Visual Defects	See section 6.5	ANSI/ASQC Z1.4

discussed in Section 6. For dimensional requirements, see 6.6.

5.1.7.1 Upholstery ticking, as well as any flange, tape, and pocketing materials used, shall exhibit a char length not exceeding 127 mm (5.0 in.), an after flame period not exceeding 2.0 s, and shall not exhibit any molten or flaming droplets, or both, when tested in accordance with Test Method D 6413. The char length and after flame requirements shall not apply to tape.

5.1.7.2 Upholstery ticking, as well as any flange, tape, and pocketing materials used, shall exhibit a char length not exceeding 127 mm (5.0 in.), an after flame period not exceeding 2.0 s, and shall not exhibit any molten or flaming droplets, or both, when tested in accordance with Test Method D 6413, after having been subjected to 15 launderings. The char length and after flame requirements shall not apply to tape.

5.1.7.3 Border ticking materials shall exhibit a char length not exceeding 38 mm (1.5 in.), an after flame period not exceeding 2.0 s, and shall not exhibit any molten or flaming droplets, or both, when tested in accordance with Test Method D 6413. Border ticking materials shall also exhibit a maximum specific optical density ( $D_{MAX}$ ) not exceeding 50, and shall not exhibit any molten or flaming droplets, or both, when tested in accordance with Test Method E 662.

5.1.7.4 Cushioning and insulator layer materials shall exhibit a char length not exceeding 127 mm (5.0 in.), an after flame period not exceeding 2.0 s, and shall not exhibit any molten or flaming droplets, or both, when tested in accordance with Test Method D 6413. Cushioning and insulator layer materials shall also exhibit a radiant panel index ( $I_s$ ) not exceeding 10 when tested in accordance with Test Method E 162. Cushioning and insulator layer materials shall also exhibit a maximum specific optical density ( $D_{MAX}$ ) not exceeding 200, and shall not exhibit any molten or flaming droplets, or both, when tested in accordance with Test Method E 662. When materials are not identical on both sides, each side shall be tested as a different specimen, with Test Method E 162 and with Test Method E 662. An optional additional fire test, applicable if the mattress is intended for use aboard U.S. Navy vessels, is shown in Annex A2.

#### 5.1.7.5 *Physical Properties:*

(1) Upholstery ticking materials shall exhibit a tear strength of no less than 1.6 kg (3.5 lb) in either the warp or the filling direction when tested in accordance with Test Method D 1424. Upholstery ticking materials shall also exhibit a breaking strength of no less than 42.6 kg (94 lb) in the warp direction and of no less than 26.3 kg (58 lb) in the filling direction when tested in accordance with Test Method D 5034.

(2) Border ticking materials shall exhibit a tear strength of no less than 1.8 kg (4 lb) in either the warp or the filling direction when tested in accordance with Test Method D 1424. Border ticking materials shall exhibit a breaking strength of no less than 42.6 kg (94 lb) in the warp direction and of no less than 22.7 kg (50 lb) in the filling direction when tested in accordance with Test Method D 5034.

(3) Cushioning and insulator layer materials shall exhibit a dry heat aging/compression force deflection of no more than 20 % change in compression force deflection when tested in accordance with Sections C and K of Test Method D 3574.

5.1.8 *Label*—The label shall state that the mattress meets one of the following sets of fire test requirements: (1) this specification (per Table 1 and Table 2), (2) California Technical Bulletin 129, or (3), Purchase Description—Mattress—Innerspring, Flame-Resistant, Shipboard—NAVSEA 05L PD 4-02 (May 2002).

5.2 *Solid Core Mattress*—The required components of a solid core mattress are cushioning and upholstery ticking.

5.2.1 All materials used shall meet the mechanical property and fire performance requirements of Table 1, as indicated in 5.1, for innerspring mattresses, as applicable. All materials used shall comply with appropriate commercial bedding industry standards of manufacture and durability.

5.2.2 *Mattress*—All mattress components shall meet the requirements of Table 1, as appropriate. The overall mattress shall meet the performance requirements of Table 2.

5.2.3 *Label*—The label shall state that the mattress meets one of the following sets of fire test requirements: (1) this specification (per Table 1 and Table 2), (2) California Technical Bulletin 129, or (3), Purchase Description—Mattress—Innerspring, Flame-Resistant, Shipboard—NAVSEA 05L PD 4-02 (May 2002).

5.3 *Box Spring*—The tolerances of the overall length, width and thickness dimensions of the box spring shall be consistent with the mattress dimensions. Fig. 1 shows an example of a typical design of box spring. The top wire assembly shall be attached securely to the border wire.

5.3.1 The individual coils shall be securely attached to the top wire assembly. The coils, or the complete spring assembly, shall be given thermal treatment to relieve residual stresses caused by coiling. The wood frame assembly shall be suitable for commercial use or for use aboard U.S. Navy vessels. All four corners shall be suitably fastened at each point of attachment, in accordance with standard commercial bedding practices. All bottom edges shall be eased (sharp corners blunted by sanding). The wood base frame shall be constructed of industry standard box spring frame lumber, typically Eastern Canadian spruce or Southern yellow pine. The spring assembly shall be attached to the wood base frame.

5.3.2 *Cushioning, Insulation Layers, Ticking and Construction*—The requirements for materials and manufacture of all other components shall be as those for innerspring mattresses, in 5.1, as applicable. The insulation layer shall be attached to the top surface to prevent slippage. Each corner shall be filled with cushioning material, to provide proper tailoring. The box spring border ticking shall be of the same material as that of the mattress. The top panel shall be of a material that retards slipping. The cover assembly shall be placed over the top of the steel and wood assembly and properly attached, in accordance with standard commercial bedding practices.

5.3.3 The box spring shall display trade labels regarding material content and manufacturer as required by law.

5.3.4 *Label*—The label shall state that the box spring meets one of the following sets of fire test requirements: (1) this specification (per Table 1 and Table 2), (2) California Technical



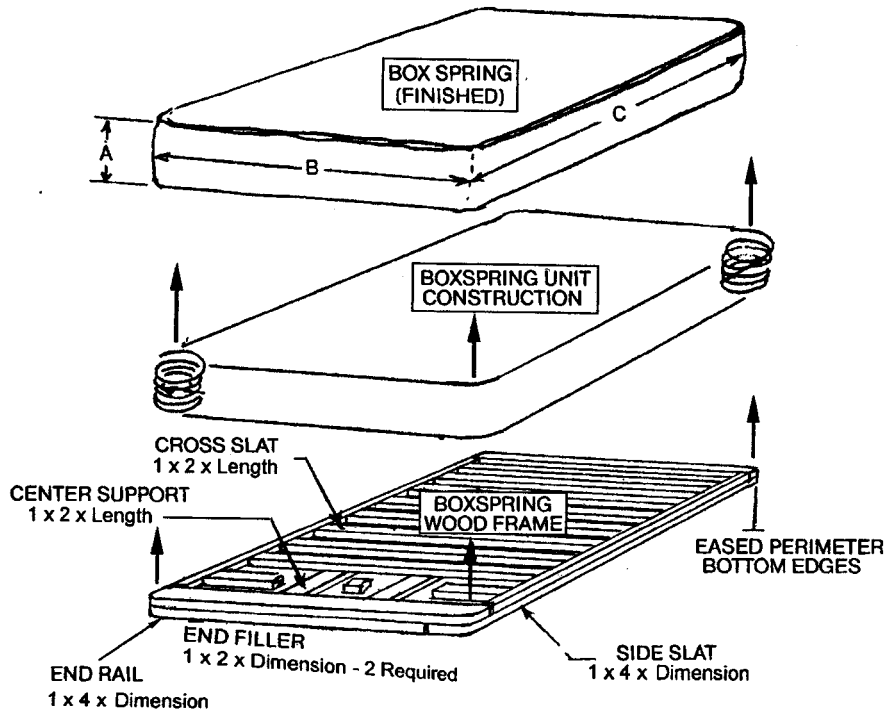


FIG. 1 Example Design of Box Springs

Bulletin 129, or (3), Purchase Description—Mattress—Innerspring, Flame-Resistant, Shipboard—NAVSEA 05L PD 4-02 (May 2002).

5.4 *Mattress/Box Spring:*

5.4.1 Packaging shall protect the products from physical damage and be acceptable to a common carrier.

5.4.2 Each item shall be clearly marked in accordance with the purchase order requirements.

6. Performance Requirements for the Complete Mattress

6.1 The complete mattress shall meet the performance requirements shown in Table 2.

6.2 *Fire Performance Requirements*—At a minimum, the mattress shall comply with the requirements of 6.2.1-6.2.4 (consistent with those contained in NFPA 301).

6.2.1 The mattress ticking shall pass the requirements for Class A performance in accordance with 16 CFR 1632.

6.2.2 The mattress shall exhibit a maximum rate of heat release not exceeding 100 kW when tested in accordance with Test Method E 1590.

6.2.3 The mattress shall exhibit a total heat released in the first 10 min of test not exceeding 25 MJ when tested in accordance with Test Method E 1590.

6.2.4 The mattress shall exhibit a mass loss in the first 10 min of test not exceeding 1.4 kg (3 lb) when tested in accordance with Test Method E 1590.

6.3 *Optional Fire Performance Requirements*—As an option, the mattress shall be permitted to exhibit fire performance in accordance with the fire test method described in Annex A1. This will involve, at a minimum, that the mattress comply with the requirements of 6.3.1-6.3.3. If a mattress is intended for use aboard U.S. Navy vessels, it shall be required to comply with

the criteria shown in 6.3.1-6.3.3, when tested in accordance with the fire test method described in Annex A1.

6.3.1 The mattress shall exhibit a maximum rate of heat release, during the test, not exceeding 150 kW.

6.3.2 The mattress shall exhibit a maximum average specific extinction area, during the test, not exceeding 300 m<sup>2</sup>/kg.

6.3.3 The mattress shall not exhibit flaming droplets during the test.

6.4 *Physical Characteristics:*

6.4.1 The mattress shall exhibit a firmness rating of 330 N (75 lbf) ± 10 %, and shall not exhibit any signs of wear, tear, damage, or degradation, when tested for 100 000 cycles in accordance with Section 7 of Test Method F 1566. The test report shall include the initial firmness rating, the firmness rating after 25 000,

50 000, and 75 000 cycles, as well as the final firmness rating after 100 000 cycles. The test report shall also include any signs of wear, tear, damage, or degradation on any part of the mattress when inspected after each set of 25 000 cycles.

6.4.2 The mattress shall exhibit a permanent deformation not exceeding 20 % of depth, when tested in accordance with the Rollator Test section of Test Method F 1566.

6.4.3 The mattress shall exhibit an accumulated dimple not to exceed 44.5 mm (1.75 in.), when tested in accordance with the Cornell Test section of Test Method F 1566.

6.4.4 The mattress shall exhibit a support firmness change not exceeding (+40 %) or (-15 %), when tested in accordance with the Cornell Test section of Test Method F 1566.

6.5 *Visual Inspection*—Visual inspection shall be conducted to check for any defects in the finished mattress, as shown in Table 3. The finished mattresses shall be clean and free from defects and other conditions affecting form, fit, function, and

**TABLE 3 Defects**

Material	Any hole, cut, tear, thick or thin place, mend, smash causing the mattress not to meet its intended performance use shall be scored as a major defect. Otherwise shall be scored as a minor defect.
Construction	Major defects: Design and construction of the mattress not as specified in Section 3. Springs not completely filled in the mattress. Mattress ends have loose, sagging appearance; filling not evenly distributed; clearly noticeable lumps; thin hollow spaces; and corner(s) not firm. Mattress not in accordance with the requirements in this specification. Stitch type, seam type, and stitches per inch not as specified; needle chew and/or needle cutting; end of stitching when not caught in another seam; broken stitch not repaired as specified; open seam, skipped or runoff stitches, raw edges. Seam allowances not as specified; loose or tight tension; badly pleated, caught or twisted in any unrelated row of stitching. Thread breaks and ends of stitching not caught in another line of stitching, backstitched less than 13 mm (0.5 in.). Thread type not as specified shall be scored as a major defect.
Labels	Major defect: Label omitted, incorrect, illegible, misplaced, not attached as specified, or stitched through printing; bar code causes damage to the item.
Cleanliness	Any spot, dirt, stain (grease, oil, ink, and so forth) or odor; five or more thread ends or more than 10 mm (3/8 in.); loose threads not removed shall be scored as a minor defect unless defect causes mattress not to meet its intended performance, then it shall be scored as a major defect.

appearance. The lot size shall be expressed in units of mattresses. The sample unit shall be one mattress. The inspection shall be performed in accordance with ANSI/ASQC Z1.4.

6.6 Dimensional requirements for mattresses are contained in ANSI A.357.1-1981. Dimensional requirements for inner-spring mattresses intended for use aboard U.S. Navy vessels are contained in Purchase Description—Mattress—Innerspring, Flame-Resistant, Shipboard—NAVSEA 05L PD 4-02 (May 2002).

NOTE 1—Dimensional requirements in NAVSEA 05L PD 4-02 are contained in inch-pound units.

## 7. Workmanship, Finish and Appearance

7.1 All workmanship and material shall be of specified quality in keeping with the best commercial marine practice so as to produce each item suitable for its intended use.

7.2 Where first article inspection is required, it shall be spelled out in the purchase order.

## 8. Inspection and Certification

8.1 The manufacturer or distributor shall issue a certificate of conformance for each shipment of mattresses and of box springs to this specification. In addition, the manufacturer or distributor shall have available (upon request) independent test data to depict compliance with the stated fire test criteria, either for Test Method E 1590 or for the test method described in Annex A1 of this specification. The independent test data shall always reflect a test date not to exceed a time period of three years from the date of product shipment.

## 9. Keywords

9.1 berths; box springs; fire; fire test; heat release; inner-spring mattress; marine; marine berth mattress; naval vessel; solid core mattress

## ANNEXES

### (Mandatory Information)

#### A1. FIRE TEST METHOD FOR MATTRESSES FOR USE IN HIGH RISK MARINE VESSEL OCCUPANCIES

A1.1 This fire test method is a modification of the one in Test Method E 1590, as developed by the U.S. Navy for determining the acceptability of mattresses for use aboard marine vessels. It assesses the burning behavior of mattresses by determining heat release, smoke release, mass loss, and combustion product release when a mattress is subjected to a specified flaming ignition source under well-ventilated conditions.

##### A1.2 Apparatus and Procedure:

A1.2.1 The apparatus shall be as described in Section 6 of Test Method E 1590, except as indicated in A1.3.

A1.2.2 The test specimen shall be as described in Section 7 of Test Method E 1590, except as indicated in A1.3.

A1.2.3 The calibration of instrumentation shall be as described in Section 8 of Test Method E 1590.

A1.2.4 The test specimen conditioning shall be as described in Section 9 of Test Method E 1590.

A1.2.5 The test procedure shall be as described in Section 10 of Test Method E 1590, except as indicated in A1.3.

A1.2.6 The calculations shall be as described in Section 11 of Test Method E 1590, except as indicated in A1.3.

A1.2.7 The test report shall be as described in Section 12 of Test Method E 1590, except for the additional information required in A1.3.5.

##### A1.3 Test Method Modifications for This Standard:

A1.3.1 The test specimen shall be a full sized mattress, mounted on an open flame bunk or support system that will allow direct flame impingement to the bottom surface and sides of the mattress by the ignition source.

A1.3.2 Replace the “T” burner described in 6.2 of Test Method E 1590 with a burner having a nominal 0.3 by 0.3 m (1 by 1 ft) top surface. The burner shall have a minimum 102 mm (4 in.) 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. The burner shall be positioned such that the top edge of the burner is  $380 \pm 13$  mm ( $15 \pm 0.5$  in.) 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.

A1.3.3 Support the mattress on a metal bed frame, constructed of heavy angle section iron, with all joints welded. The bed frame shall be nominally 1.94 by 0.76 m (76 by 30 in.) and shall contain a wire grid, constructed of nominally 2 mm (0.08 in., 12.5 gage) welded steel wire mesh, with nominally 51 by

102 mm (2 by 4 in.) openings, secured to the perimeter of the bed frame with steel tie wires.

A1.3.4 The test specimen shall be exposed to a fire producing a total heat output of  $50 \pm 3$  kW ( $47.6 \pm 2.86$  Btu/s) for the first 5 min of the test followed by an increase to  $100 \pm 5$  kW ( $95.2 \pm 4.76$  Btu/s) for an additional 10 min. The total fire exposure shall be 15 min.

A1.3.5 Report the average specific extinction area from the test ( $\text{m}^2/\text{kg}$ ), which is assessed as the total smoke released ( $\text{m}^2$ ) divided by the total mass loss (kg).

A1.4 *Critical Test Results*—The following three test results shall be presented in a summary table: (a) the maximum rate of heat release obtained during the test minus the burner heat input at the time the maximum heat release rate occurs, (b) the average specific extinction area from the test, and (c) a visual report as to whether or not burning droplets were formed and dropped to the floor or the top of the mattress platform. These critical test results are used for the pass-fail criteria described in 6.3, if the mattress is required to pass this test.

## **A2. OPTIONAL COMPONENT FIRE TEST METHOD FOR CUSHIONING MATERIALS FOR MATTRESSES FOR USE IN HIGH RISK MARINE VESSEL OCCUPANCIES**

A2.1 If required, use Test Method E 1354 for assessing the heat release rate of cushioning materials to be included in mattresses for use aboard U.S. Navy vessels, under the conditions of A2.2 and with the pass/fail criteria of A2.3.

A2.2 The cushioning material shall be tested at an incident heat flux of  $50 \text{ kW}/\text{m}^2$ , in the horizontal orientation and at a thickness of 50 mm (approximately 2 in.). Testing shall be conducted in triplicate.

A2.3 Pass/Fail Criteria:

A2.3.1 The maximum rate of heat release of the cushioning material (average of the three replicate tests) shall not exceed  $120 \text{ kW}/\text{m}^2$ .

A2.3.2 The average rate of heat release of the cushioning material during the three minutes following ignition (average of the three replicate tests) shall not exceed  $50 \text{ kW}/\text{m}^2$ .

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