



Standard Specification for Mattress and Box Springs for Use in Berths in Marine Vessels¹

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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:²

[D123 Terminology Relating to Textiles](#)

[D1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum \(Elmendorf-Type\) Apparatus](#)

[D3574 Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams](#)

[D3951 Practice for Commercial Packaging](#)

[D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics \(Grab Test\)](#)

[D6193 Practice for Stitches and Seams](#)

[D6413 Test Method for Flame Resistance of Textiles \(Vertical Test\)](#)

[E162 Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source](#)

[E176 Terminology of Fire Standards](#)

[E662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials](#)

[E1354 Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter](#)

[E1590 Test Method for Fire Testing of Mattresses](#)

[F1566 Test Methods for Evaluation of Innersprings, Boxsprings, Mattresses or Mattress Sets](#)

2.2 ANSI Standards:³

[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 1992⁴](#)

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

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

2.4 Federal Standards:

[Code of Federal Regulations Title 16, Vol 2, Part 1632⁵](#)

[Purchase Description—Mattress—Innerspring, Flame-Resistant, Shipboard—NAVSEA 05L PD 4-02 \(May 2002\)⁶](#)

2.5 NFPA Standard:

[NFPA 301 Code for Safety to Life from Fire on Merchant Vessels⁷](#)

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification associated with textiles, see Terminology [D123](#). For definitions of terms used in this specification associated with fire issues, see Terminology [E176](#).

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

⁵ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

⁶ Available from Naval Sea Systems Command (NAVSEA), 1333 Isaac Hull Ave., SE, Washington, DC 20376, <http://www.navsea.navy.mil>.

⁷ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

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 D6413
	After Flame	≤2.0 s	Test Method D6413
	No Flaming Droplets		Test Method D6413
	Flammability after 15 Launderings		
	Char Length	≤127 mm (5.0 in.)	Test Method D6413
	After Flame	≤2.0 s	Test Method D6413
	No Flaming Droplets		Test Method D6413
	Other Properties		
	Tear Strength (Note 3)	Warp: 1.6 kg (3.5 lb) min; Filling: 1.6 kg (3.5 lb) min	Test Method D1424
Border Ticking	Breaking Strength (Note 3)	Warp: 42.6 kg (94 lb) min; Filling: 26.3 kg (58 lb) min	Test Method D5034
	Flammability		
	Char Length	≤38 mm (1.5 in.)	Test Method D6413
	After Flame	≤2.0 s	Test Method D6413
	No Flaming Droplets		Test Method D6413
	D _{MAX}	50	Test Method E662
	D _{MAX}	No Flaming Droplets	Test Method E662
	Other Properties		
	Tear Strength	Warp: 1.8 kg (4 lb) min; Filling: 1.8 kg (4 lb) min	Test Method D1424
	Breaking Strength	Warp: 42.6 kg (94 lb) min; Filling: 22.7 kg (50 lb) min	Test Method D5034
Cushioning and Insulator Layers	Flammability		
	Char Length	≤127 mm (5.0 in.)	Test Method D6413
	After Flame	≤2.0 s	Test Method D6413
	No Flaming Droplets		Test Method D6413
	Flame Spread (I _s) (Note 4)	10	Test Method E162
	D _{MAX} (Note 4)	200	Test Method E662
	D _{MAX} (Note 4)	No Flaming Droplets	Test Method E662
	Other Properties		
	Dry Heat Aging / Compression Force Deflection	No more than 20 % change in compression force deflection	Test Method D3574 , Methods C and K

impact, firmness retention, and surface deformation, shall be assessed by Test Methods **F1566**. 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 in accordance with 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 in accordance with 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 in accordance with 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.

5.1.6 *Seam and Stitching*—The seam and stitch types shall be in accordance with Practice **D6193**. 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 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 **D6413**. The char length and after flame requirements shall not apply to tape.

NOTE 1—Only Molten and/or Flaming Droplets requirement, or both, applies 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 **D6413**, 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 **D6413**. 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 **E662**.

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 **D6413**. Cushioning and insulator layer materials shall also exhibit a radiant panel index (I_s) not exceeding 10 when tested in accordance with Test Method **E162**. 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 **E662**. When materials are not identical on both sides, each side shall be tested as a different specimen, with Test Method **E162** and with Test Method **E662**. 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 **D1424**. 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 **D5034**.

(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 **D1424**. 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 **D5034**.

(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 **D3574**.

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 (in accordance with **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 (in accordance with **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.

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

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~~ (in accordance with [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).

5.4 *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 [E1590](#).

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 [E1590](#).

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 [E1590](#).

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 m²/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) \pm 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 [F1566](#). 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 [F1566](#).

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 [F1566](#).

6.4.4 The mattress shall exhibit a support firmness change not exceeding (+40 %) or ~~(-15 %)~~, ~~(-15 %)~~, when tested in accordance with the Cornell Test section of Test Method [F1566](#).

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 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 innerspring 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

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

compliance with the stated fire test criteria, either for Test Method **E1590** 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; innerspring mattress; marine; marine berth mattress; naval vessel; solid core mattress

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