



Designation: F 1566 – 99

## Standard Test Methods for Evaluation of Innersprings and Boxsprings<sup>1</sup>

This standard is issued under the fixed designation F 1566; 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 (ε) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 These test methods cover nationally recognized methods for testing mattress innersprings and boxsprings to ensure uniformity of results.

1.2 These test methods are applicable to unupholstered innersprings and boxsprings only and are not applicable to finished upholstered mattresses or boxsprings. Any conclusions covering such items are outside the scope of these test methods.

1.3 The durability test (Section 7), impact test (Section 8) and firmness retention test (Section 9) require the use of an upholstered innerspring or boxspring, or both. A standardized upholstery is specified in each case.

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

1.5 *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:

- D 648 Test Method for Deflection Temperature of Plastics Under Flexural Load<sup>2</sup>
- E 4 Practices for Force Verification of Testing Machines<sup>3</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *boxspring unit, n*—a foundation for the mattress consisting of wire spring elements mounted on a frame.

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

3.1.3 *contract units, n*—a term used to indicate units marketed in large quantities, usually by contract, to quantity users, that is, hotel, motel, institutional, etc.

3.1.4 *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.

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

3.1.6 *posturized innerspring, n*—an innerspring assembly with the center third having a higher coil density or larger wire gage.

### 4. Significance and Use

4.1 Four separate test methods are outlined for use in evaluation of mattress innerspring or boxspring units, or both.

4.2 These test methods include measurements of firmness, firmness retention, durability, effect of impact, etc.

4.3 One or more of the test methods shall be used separately or in combination to provide for appropriate evaluations.

### 5. Conditioning

5.1 Prior to testing, condition units for at least 8 h at  $23 \pm 5^\circ\text{C}$  in accordance with Test Method D 648.

### 6. Firmness Rating

6.1 *Specimen*—The unit to be tested is an unupholstered mattress innerspring or boxspring unit.

#### 6.2 Apparatus:

6.2.1 *Platen*—The platen shall be a round aluminum disk weighing  $8 \pm 0.2$  lb ( $3.6 \pm 0.1$  kg) with a diameter of  $13.54 \pm 0.2$  in. ( $344 \pm 5$  mm) connected to the loading mechanism with a flexible connection (see Fig. 1).

6.2.2 *Loading Mechanism*<sup>4</sup>—A device capable of providing a load of 300 lbf (1335 N) or more with accuracy of  $\pm 1\%$ .

6.2.3 *Deflection Device*—For use in determining deflection, that is, ruler or electronic device accurate to  $\frac{1}{32}$  in. (1 mm).

#### 6.3 Test Procedure:

6.3.1 Place specimen directly onto a rigid, flat surface.

6.3.2 Run tests at four separate locations as shown in Fig. 2; Location 5 being optional.

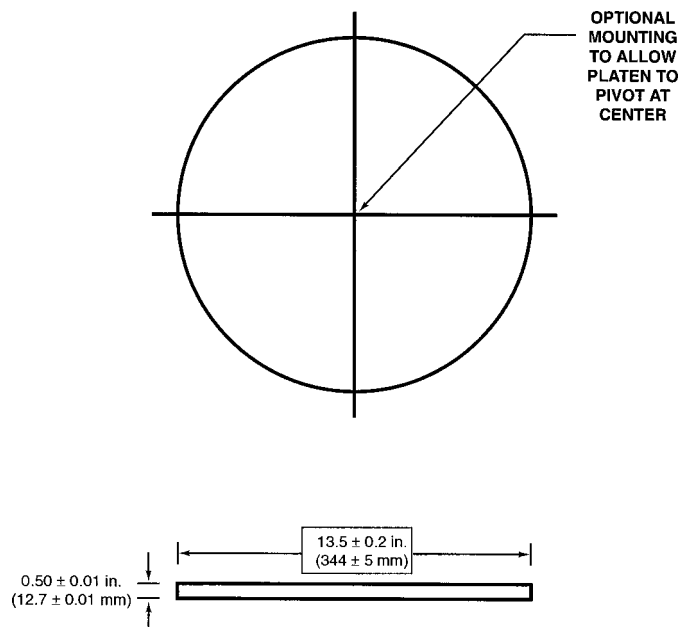
<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee F-15 on Consumer Products and are the direct responsibility of Subcommittee F15.32 on Innersprings and Boxsprings.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 08.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 03.01.

<sup>4</sup> See Practices E 4 for calibration techniques.



NOTE 1—Platen material: aluminum.  
Weight:  $8 \pm 0.2$  lb ( $3.6 \pm 0.1$  kg)

FIG. 1 ILD Platen

6.3.3 At each test location, determine resistance values in 0.5-lbf (2-N) increments at 0.5, 1, 1.5, 2, 2.5, and 3 in. (12.5, 25, 38, 50, 63, and 76 mm) with a tolerance of  $\pm 0.04$  in. ( $\pm 1$  mm) of deflection of the top surface for innersprings and 0.5 and 1 in. (12.5 and 25 mm) with a tolerance of  $\pm 0.04$  in. ( $\pm 1$  mm) of deflection of the top surface for boxsprings.

#### 6.4 Calculation/Results:

6.4.1 Determine a firmness rating for uniformly constructed innerspring units by totaling resistance values at Locations 3 and 4 for all deflections and dividing the total by 2 (for an average).

6.4.2 Determine firmness rating for non-uniformly constructed (posturized) innerspring units by using resistance values at Location 3 only.

6.4.3 Determine a firmness rating for the calf/shoulder area using the values at Location 4 only. Any difference between readings 3 and 4 will be calculated as a percentage of increase of Location 3 over the readings at Location 4.

6.4.4 Determine a firmness rating for the edge by totaling the resistance values at Locations 1 and 2 for all deflections and dividing the total by 2 (for an average).

6.4.5 *Optional*—Determine a firmness rating of the corner by totaling as the resistance value for all deflections at Location 5.

## 7. Durability Test

### 7.1 Specimen:

7.1.1 When testing innerspring units, standard upholstered boxsprings shall be used for the comparison. Conversely, when testing boxspring units, standard innerspring mattresses shall be used. A 312-coil, 13-gage, 0.092-in. (2.34-mm) diameter, tempered steel spring wire, 5-turn, shall be the standard test innerspring unit and an 81-coil, 10-gage, 0.135-in. (3.4-mm)

diameter, tempered steel spring wire boxspring unit shall be the standard foundation construction.

7.1.2 The border wire on the innerspring and boxspring units shall be a minimum of 6-gage, 0.192-in. (4.9-mm) diameter.

7.1.3 The test upholstery for the innerspring mattress will be a  $1.85 \pm 0.15$  oz/ft<sup>2</sup> ( $565 \pm 45$  g/m<sup>2</sup>) synthetic fiber pad primary insulation layer positioned next to the subject on both flat surfaces. A 0.75-in. (19-mm) thick  $1.1 \pm 0.1$ -lb/ft<sup>3</sup> ( $17.5 \pm 1.5$ -kg/m<sup>3</sup>) density, 25 to 35-lbf (110 to 155-N) polyurethane foam cushioning layer shall be placed on top of the primary insulator pad on each side. A quilt assembly sandwich shall be constructed consisting of a top layer of 100-end damask fabric ticking. The middle layer of 0.5-in. (13-mm) thick,  $1.1 \pm 0.1$ -lb/ft<sup>3</sup> density, 25 to 35-lbf polyurethane foam and the bottom layer is of  $1.0 \pm 0.5$ -oz/yd<sup>2</sup> ( $34 \pm 17$ -g/m<sup>2</sup>) quilt backing.

7.1.4 This assembly shall be unitized by automatic sewing and then placed over the foam cushioning layer on both sides and attached to the subject mattress innerspring, using techniques commonly accepted by the bedding industry.

7.1.5 The boxspring assembly shall be upholstered with a  $1.85 \pm 0.15$ -oz/ft<sup>2</sup> ( $52.4 \pm 4.0$ -g/m<sup>2</sup>) synthetic fiber pad primary insulator next to the subject boxspring. The fabric of commercially acceptable grades shall be placed directly over the pad and attached to the spring and wood assembly, using techniques commonly accepted by the bedding industry.

### 7.2 Apparatus:

7.2.1 *Juggernaut Roller*<sup>5</sup> (see Fig. 3)

7.2.1.1 *Shape of Roller*, 6-sided,

7.2.1.2 *Length*,  $36 \pm 3$  in. ( $915 \pm 75$  mm),

7.2.1.3 *Weight*,  $240 \pm 10$  lb ( $109 \pm 4.5$  kg),

7.2.1.4 *Diameter of Roller (Flat to Flat)*,  $17 \pm 1$  in. ( $430 \pm 25$  mm),

7.2.1.5 *All Sharp-edged Radiuses*, not to exceed 2 in. (50 mm),

7.2.1.6 *Operating Speed*, not to exceed 20 cycles/min, and

7.2.1.7 *Roller*, should float free of arm.

7.2.2 *Deflection Device*—A method of determining deflection, that is, ruler or electronic device accurate to  $\frac{1}{32}$  in. (1 mm).

### 7.3 Test Procedure:

7.3.1 Determine a firmness rating of the unupholstered specimen in accordance with Section 6.

7.3.2 Place unupholstered specimen directly on a rigid, flat surface.

7.3.3 Measure height of unupholstered specimen at Position 3 (see Fig. 2).

7.3.4 Upholster specimens as described in 7.1.3-7.1.5.

7.3.5 Testing shall be done in the center of the mattress (measured from head to foot) across the mattress surface from side to side.

NOTE 1—This simulates sleeper action most realistically.

7.3.6 A hold down device shall be used outside of the roller path to keep mattress from moving.

<sup>5</sup> Detailed construction drawings for this equipment are available from American Innerspring Manufacturers Association, 1918 North Parkway, Memphis, TN 38112.