



Designation: **F3359—19 F3359/F3359M – 21**

## Standard Test Method for Determining Bending Yield Moment of Staples<sup>1</sup>

This standard is issued under the fixed designation **F3359/F3359M**; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope

1.1 This test method covers procedures for determining the bending yield moment of staples when subjected to static loading. Although intended for flat crown staples identified in Specification **F1667/F1667M**, this procedure is also applicable for staples with round wire. These staples are used in engineered wood building connection applications for which required connection capacities are specified by the designer.

1.2 The values stated in either SI units or inch-pound units are to be regarded as standard. ~~No other units of measurement are included in this standard.~~ separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

NOTE 1—This test method is applicable in either inch-pounds **F3359** or SI Units [**F3359M**]. Values stated in SI are a mathematical conversion and are shown in brackets [ ].

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

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

**E4 Practices for Force Calibration and Verification of Testing Machines**

**F1667/F1667M Specification for Driven Fasteners: Nails, Spikes, and Staples**

### 3. Terminology

#### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *bending yield moment ( $M_y$ )*—the critical strength characteristic used in yield theory calculations and determined in accordance with **9.2**.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee **F16** on Fasteners and is the direct responsibility of Subcommittee **F16.05** on Driven and Other Fasteners. Current edition approved Dec. 1, 2019/Dec. 1, 2021. Published January 2019/January 2022. Originally approved in 2018. Last previous edition approved in 2018 as **F3359—18—19**. DOI: ~~10.1520/F3359-19~~10.1520/F3359\_F3359M-21

<sup>2</sup> 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.

3.1.2 *flat crown staple*—a two-pronged fasteners in which round or flattened wire is bent into an approximate U-shape with approximately equivalent leg lengths.

3.1.3 *flat crown staple dimensions*—All dimensions taken before application of or after removal of any coating, as shown in Fig. 1.

3.1.3.1 *crown width (C)*—Distance measured along the top of the staple from the outside of the staple legs.

3.1.3.2 *leg length (L)*—Distance from top of staple crown to bottom of leg.

3.1.3.3 *thickness (T)*—Distance perpendicular to the width of the leg for a flattened wire staple.

3.1.3.4 *test span (S<sub>bp</sub>)*—Cylindrical bearing point spacing (test span length) as shown in Fig. 2.

3.1.3.5 *width (W)*—Distance across the flatten portion of wire.

3.1.4 *proportional limit load*—is the load at which the load-deflection curve deviates from a straight line fitted to the initial portion of the load- deflection curve as shown in Fig. 3.

3.1.5 *yield load (P)*—the load determined from the load-deflection curve in accordance with 9.1.

3.1.6 *yield theory*—the model for lateral load design values for dowel-type fasteners that specifically accounts for the different way connections behave under load.

#### 4. Summary of Test Method

4.1 Test specimens are evaluated to determine capacity to resist lateral bending loads applied at a constant rate of deflection with a suitable testing machine. The load on the test specimen at various intervals of deflection is measured. Supplementary physical properties of the test specimen are also determined.

#### 5. Significance and Use

5.1 Staples are mechanical fasteners used in wood structures. Engineering design procedures used to determine the capacities of laterally-loaded staple connections use a yield theory to establish nominal resistance (Note 1<sup>2</sup>). In order to develop nominal resistance for laterally-loaded stapled connections, the bending yield moment must be known.

NOTE 2—When used as a structural fastener in shear walls and diaphragms, staples are installed with the crown parallel to the long dimension of the framing member. The orientation of the staples for this bending yield moment test represents the bending yield moment applicable for this intended use).

#### 6. Apparatus

6.1 *Testing Machine*—Any suitable testing machine capable of operation at a constant rate of motion of its movable head.

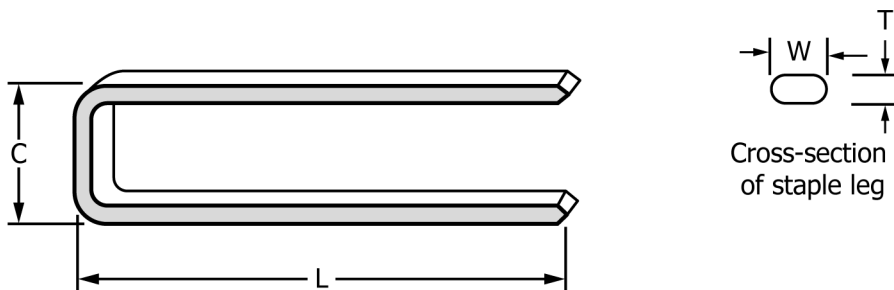


FIG. 1 Flat Crown Staple Dimensions

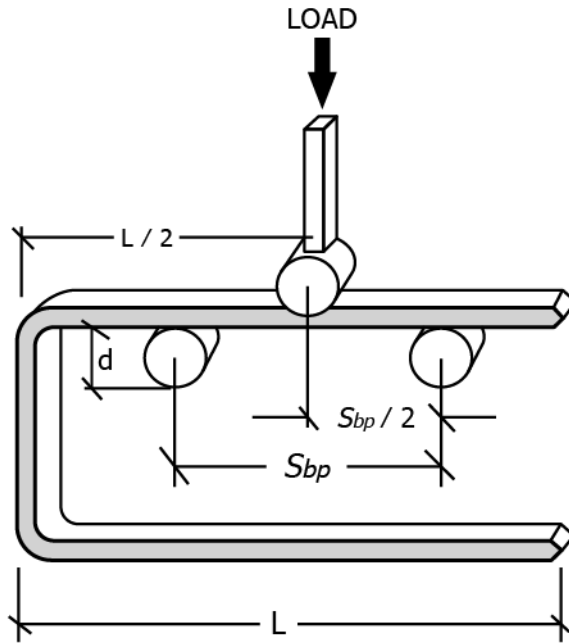


FIG. 2 Cylindrical bearing point spacing

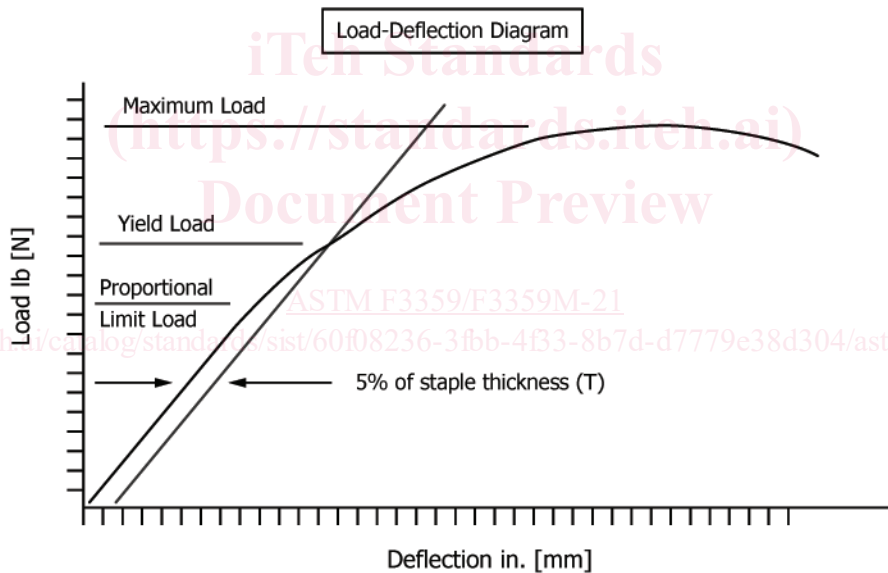


FIG. 3 Load- Deflection Curve

6.2 *Cylindrical Bearing Points*—Any cylindrical metal members with a diameter of 0.375 in., [9.53 mm], capable of supporting the test specimen during loading without being deformed, as shown in Fig. 2.

6.2.1 Cylindrical bearing points shall allow free rotation as the test specimen is deformed.

6.3 *Cylindrical Load Point*—Any cylindrical metal member with a diameter of 0.375 in. [9.53 mm] capable of loading the test specimen without being deformed, as shown in Fig. 2.

6.4 *Instrumentation*—Load and deflection shall be continuously measured and recorded.

6.4.1 Deflection shall be measured with a transducer having at least a sensitivity of 0.001 in. [0.01 mm].