Designation: F2844 – 11 (Reapproved 2016)

An American National Standard

Standard Test Method for Displacement Compression of Softball and Baseball Bat Barrels[1]

This standard is issued under the fixed designation F2844; 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 This test method describes a comparative measurement method for determining the compression force of softball and baseball bat barrels as defined by a static compression displacement test.

1.2 This standard is not intended to define the performance of softball or baseball bats but to determine the intrinsic barrel compression of a specific bat.

1.3 This standard can be used to compare the relative barrel compression force of bats using a relatively slow, non-impact loading rate.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *barrel compression, n*—the force reading to deflect the bat barrel by the specified distance.

2.1.2 *barrel deflection, n*—the displacement of the load head during the test.

2.1.3 *bat taper, n*—section of the bat where the barrel diameter begins to decrease to join the handle of a much smaller diameter.

2.1.4 *force, n*—the amount of resistance applied perpendicular to the surface of a bat barrel to cause the barrel to displace.

2.1.5 *non-solid bat, n*—a bat of hollow construction.

2.1.5.1 *Discussion*—Bat may be filled with inserts or flexible materials and still be considered a non-solid bat.

3. Significance and Use

3.1 This test method offers a means to compare the barrel compression of softball and baseball bats. This test is not intended for wood or solid bats.

4. Apparatus

4.1 *Compression Device,* to compress the test bat between two rigid cylindrical shapes to at most 0.070 in. (1.78 mm) net displacement. The device shall allow testing at any point along the barrel, to within 2 in. of the end cap. The compression device must be able to produce a load of at least 1000 lb (4459 N). The load heads shall be able to open more than 2.75 in. (69.9 mm). The width of the device needs to be sufficient so that the force shall be applied through the centerline of the barrel diameter and load cylinders. A means of centering the test bat is required so that the axis of the bat barrel is perpendicular (±2°) with the cylindrical platens. The device should provide the ability to control the force to 1 lb (4.5 N) and deflection to 0.001 in. (0.025 mm).

4.2 *Load Heads*—A pair of cylindrical shapes with a radius of curvature of 1.93 ± 0.050 in. (49 ± 1.3 mm) over a chord height of at least 0.20 in. (5 mm) (as shown in Fig. 1) made of steel or a material of equivalent stiffness. The heads are set with their centerline's within ±0.010 in. (±0.25 mm), their cylindrical axis parallel within ±1° and their curved surfaces in direct opposition to each other.

4.3 *Load Cell,* to measure the compressive load up to at least 1000 lb (4459 N) with a resolution of at least 1 lb (4 N).

4.4 *Displacement Gauge,* with a range of at least 1.0 in. (25.4 mm) and a resolution of no less than 0.001 in. (0.025 mm).

4.5 *Calibration Cylinder*—A 2.25-in. (57-mm) diameter hollow metal cylinder with a barrel compression between 200 and 300 lb. The cylinder's calibrated compression and calibration date shall be marked on the cylinder. The strength of the cylinder shall be sufficient not to permanently yield under a 0.07-in. (1.78-mm) displacement when tested in accordance with this standard.

[1] This test method is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.26 on Baseball and Softball Equipment.

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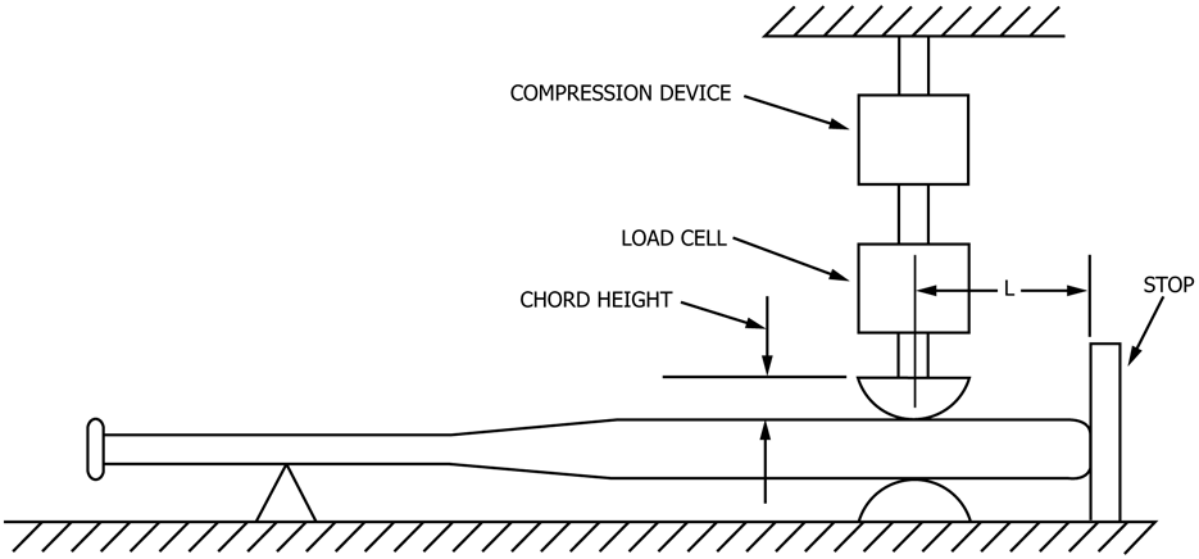

FIG. 1 Test Apparatus

5. Calibration and Standardization

5.1 Test the calibration cylinder following this standard before each test session. If the compression of the calibration cylinder differs by more than ±20 lb (±89 N) from its calibrated value, recalibrate the load cell or displacement gauge, or both, per the manufacturer's instructions.

5.2 Calibrate the load cell, displacement gauge, and the calibration cylinder at least annually to a NIST traceable standard.

6. Conditioning

6.1 Test unit shall be within operating limits of the force gauge and deflection gauges used.

7. Procedure

7.1 Place the bat in the compression press so that the longitudinal axis of the bat is perpendicular (±2°) to the cylindrical platens and the cap end of the bat is 6 ± 0.25 in. (152 ± 6 mm) from the centerline of the cylindrical platens. When testing bats with tapered barrels, a stop at the end of the barrel is needed to prevent the bat from moving axially during load application.

7.2 Set the load cell gauge to zero.

7.3 Activate the compression press until the cylindrical load heads are in contact with the bat with 10 ± 5 lb (44 ± 22 N) pre-load applied to the bat.

7.4 Set the load cell gauge and displacement gauge to zero.

7.5 Compress the bat at a rate which is sufficient to complete the deflection in 10 to 20 s.

7.5.1 Softball bats shall have an initial displacement of 0.020 ± 0.001 in. (0.51 ± 0.025 mm).

7.5.2 Baseball bats shall have an initial displacement of 0.010 ± 0.001 in. (0.25 ± 0.025 mm).

7.6 Set the load cell gauge and displacement gauge to zero.

7.7 Compress the bat at a rate which is sufficient to complete the deflection in 10 to 20 s.

7.7.1 Softball bats shall have a displacement of 0.050 ± 0.001 in. (1.3 ± 0.025 mm).

7.7.2 Baseball bats shall have a displacement of 0.030 ± 0.001 in. (0.76 ± 0.025 mm).

7.7.3 Record the peak load and corresponding displacement.

7.8 Release the applied load.

7.9 Repeat the steps in 7.1 – 7.8 at +45°, –45°, and 90° from the test first orientation.

7.10 The bat may be tested at locations other than the 6 in. (152 mm) location, provided the alternate location is at least 2 in. (51 mm) from the end cap and taper. In these cases, the barrel compression location should be noted (L in Fig. 1).

8. Calculation

8.1 Barrel Compression (BC) is calculated from the average of the four readings as:

$$BC = \frac{1}{4}(F_0 + F_{+45} + F_{-45} + F_{90}) \quad (1)$$

where:

BC = barrel compression (lb or N)
F_θ = Compression force from the loading at the angle θ (lb or N)

9. Report

9.1 Report the following information:

9.1.1 Name of the test facility and test operator;

9.1.2 Test date;

9.1.3 Test equipment used for this test method, including:

9.1.3.1 Bat model, length, weight, and any other pertinent data such as condition of the bat or modifications to the bat, and

9.1.3.2 Each bat barrel compression and deflection reading as shown in Table 1;

TABLE 1 Compression and Deflection Readings

Angle	Compression Force (lb or N)	Deflection (in. or mm)	Location from end of Barrel (in. or mm)
0°			
+45°			
–45°			
90°			
Avg.			

9.1.4 Any important observations; for example, damage to the bat or any noises; and

9.1.5 Calibration certificate numbers for measurement devices.

10. Precision and Bias

10.1 Precision and bias evaluations have not been conducted for this test method. When such data are available, a precision and bias section will be added.

11. Keywords

11.1 ball bat; compression-displacement; compression force