

Standard Test Methods for Measuring High-Speed Bat Performance¹

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1. Scope

1.1 A method for determining bat performance by measuring the bat-ball coefficient of restitution (BBCOR), deriving the ball exit speed ratio (BESR), and calculating a batted-ball speed (BBS). It is applicable to baseball and softball bats of any construction or material. The test methods provide quantitative measures of bat dynamic performance that may be used for comparison purposes.

1.2 The BBCOR, BESR, and BBS are each calculated from measurements taken in the laboratory on test equipment meeting the requirements defined in this standard.

1.3 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.

1.4 *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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

F1887 Test Method for Measuring the Coefficient of Restitution (COR) of Baseballs and Softballs

F1888 Test Method for Compression-Displacement of Baseballs and Softballs

F2398 Test Method for Measuring Moment of Inertia and Center of Percussion of a Baseball or Softball Bat

F2845 Test Method for Measuring the Dynamic Stiffness (DS) and Cylindrical Coefficient of Restitution (CCOR) of Baseballs and Softballs

¹ These test methods are under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and are the direct responsibility of Subcommittee F08.26 on Baseball and Softball Equipment.

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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. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *balance point (BP)*, n —distance to the center of mass from the knob end of the bat.

3.1.2 *ball exit speed ratio (BESR)*, n —ratio of ball exit speed to the ball inbound speed plus $\frac{1}{2}$.

3.1.3 *bat-ball coefficient of restitution (BBCOR)*, n —COR of a specific ball colliding with a bat.

3.1.4 *batted ball speed (BBS)*, n —the speed that a ball would be hit off a bat in play based on given pitch and bat speeds.

3.1.5 *coefficient of restitution (COR)*, n —measure of impact efficiency calculated as the relative speed of the objects after impact divided by the relative speed of the objects before impact.

3.1.6 *cylindrical coefficient of restitution (CCOR)*, n —the ratio of the rebound to incoming speed of a ball impacting a solid rigid cylinder.

3.1.7 *dynamic stiffness (DS)*, n —a normalized measure of the ball impact force having units of stiffness (lb/in. or kN/m). It is obtained by dividing the square of the peak force between the ball and impact surface by the ball mass and the square of the incoming ball speed.

3.1.8 *moment of inertia (MOI)*, n —measure of mass distribution relative to an axis of rotation. It is the product of the mass multiplied by the square of the distance to the mass, summed over the entire bat.

3.1.9 *test sponsor*, n —group, association or individual specifying test requirements including ball specifications, performance measure, and test speed.

4. Significance and Use

4.1 These test methods offer a laboratory means to quantitatively compare the performance of baseball and softball bats.

4.2 Use of these test methods can provide quantitative metrics of bat performance.

5. Apparatus and Equipment

5.1 *Test Balls*—Baseballs or softballs as determined by the test sponsor.