

The BBCOR Bat Standard

Batted Ball Coefficient of Restitution by Steve Orinick

This new standard measures bat performance and replaces the previous BESR standard. Beginning in January 2011 for NCAA (college) play and January 2012 for NFHS (high school) play, all bats must be BBCOR certified. BESR (Ball Exit Speed Ratio) is no longer considered accurate enough to determine the actual performance of differing bat models.

Instead of measuring the speed of the ball after it is batted, BBCOR measures the "bounciness" of the ball and bat, or the "trampoline" effect. When a bat hits a ball, the ball actually compresses / deforms by nearly a third at high pitch velocities.

Bat performance is specified by using the BBCOR, which for mathematicians is calculated using the inbound and rebound speeds of the ball:

$$BBCOR = \frac{v_R}{v_I} (1 + r) + r + C_{ball}$$

where v_I and v_R are the ball inbound and rebound speeds respectively, r is calculated using the equation below, and C_{ball} is the measured correction factor for each baseball.¹

$$r = m \left[\frac{1}{W} + \frac{(L - BP - z)^2}{I - W(BP - 6)^2} \right]$$

A pitched ball holds a lot of energy that you can see in the spin and speed of the ball. With solid wood bats, much of that energy is lost as the ball compresses on impact. The batted ball speed gets much of its energy from the bat. With hollow-core aluminum or composite bats, the thin walls "flex" slightly, the ball distorts less, retains its pitched energy and adds to it the power of the bat speed. Hence, non-wood bats hit balls faster.

The loss of energy at impact is what BBCOR measures. The less energy lost, the faster the ball speed after it gets launched off the bat.

A simple way to think of BBCOR is to jump up and down on a hard floor. It takes a lot of energy in your legs to get off the ground. The floor doesn't help at all. Contrast that feeling by jumping on a trampoline. Even with very little energy from your body, you will still get a bounce because that energy isn't being absorbed by the trampoline. Instead, the trampoline is flexing with the impact and then "bouncing" back to its original shape, thus launching you higher into the air.

It's that faster flight that has changed the game of baseball over the last several years.

Home runs are far more common today than they were years ago. According to NCAA Divisions I baseball statistics, in 2007 the per-game average of home runs hit was 0.68. That number increased to .84 in 2008 and .96 in 2009. The per-game average of home runs hit was .94 during spring, 2010. The runs scored per game have also increased steadily since 2007 when it was 6.10 runs per game. In 2008, there were an average of 6.57 runs per contest and that rose to 6.88 in 2009 and 6.98 in 2010.²

With a 10-15% decrease in bat performance, the game will be much more "balanced" among all players. More importantly, slower speed batted balls will address some of the safety concerns that have become prevalent in recent years. Both the NCAA and NFHS want all bats to have the same performance factors as the best wood bats. While it may still be cost effective to purchase aluminum or composite bats that will last longer than wood bats, it won't necessarily make you a better hitter. You'll have to swing faster and more accurately to get the same results as before.

According to the NFHS, "the new standard ensures that performances by non-wood bats are more comparable to those of wood bats. It's also expected to minimize risk, improve play and increase teaching opportunities". They also state "After working with the NCAA and having access to its research, we've concluded it's in our best interest to make this change. BBCOR includes the BESR standard, so we're actually expanding upon our current standard, which will be more appropriate for our age and skill level."

If your team plays under NCAA or NFHS rules, you almost certainly will need a new bat. Bat manufacturers have been able to adjust their designs with very little notice. The first BBCOR-certified bats began appearing in warehouses in August 2010 and I have seen a few in high school games this season. Look for the BBCOR compliance mark which will be on all bats that meet the new standard (see below). The BBCOR must be less than or equal to .500.

Manufacturers are modifying aluminum and composite bats to make the walls stiffer. In some cases they are actually inserting a block behind the sweet spot so it won't flex as much. In other instances they are simply adding thickness to the wall.

The NFHS is currently reviewing composite bats, which is a separate issue. It is felt that they do not maintain their rated characteristics for the life of the bat and that their performance increases the more they are used. Additional Accelerated Break In (ABI) testing is being performed on bats submitted by the manufacturer. With a few exceptions, they are banned at this time.

The NCAA is currently requiring BBCOR bats for the 2011 season. Reports are that it has made a dramatic change in the offensive side of the game, similar to wood bat leagues. The change should take baseball back closer to what it once was before the dawn of the metal bat.

Illegal Bat Penalties

Before the batter steps into the box: Under all codes, if detected, the umpire can direct the player to switch to a legal bat. There is no penalty.

The batter is in the box but has not seen a pitch: Under NFHS and pro rules, the batter is considered to have used the illegal bat as soon as he steps into the box.

The batter is in the box and a pitch has been thrown: Under NCAA rules, a pitch has to be thrown for the illegal bat to be considered as used. It is irrelevant if the batter has swung at the pitch or not.

Penalty: The batter is out and all runners return to the base occupied at the start of the at-bat. Any runner advance that did not come as a result of the plate appearance (balk, stolen base, etc.) are permitted. The illegal bat must be discovered before the first pitch to the next batter.

NFHS Bat Rules



INDIANAPOLIS, IN (July 7, 2010) — One of six new rules changes by the National Federation of State High School Associations (NFHS) Baseball Rules Committee forbids the use of composite bats until they can meet the Batted Ball Coefficient of Restitution (BBCOR) performance standard. The changes, which were subsequently approved by the NFHS Board of Directors, will take effect with the 2010-11 school year.

After thorough testing by the Baseball Research Center at the University of Massachusetts–Lowell, the NFHS Baseball Rules Committee voted to outlaw composite bats until they can produce consistent results through the life of the bat, be made tamper-evident and be labeled as a composite product.

Elliot Hopkins, NFHS liaison to the Baseball Rules Committee, visited with James Sherwood, director of the Baseball Research Center, and spent several hours witnessing composite bat testing. "Rolling the bat gives it a higher performance," Hopkins said. "It can significantly increase the performance and that's huge in our game."

Rolling the bat isn't the only problem. Rolling only speeds up the performance enhancement that would occur over time after normal use. Even composite bats that were not altered will eventually see this increase in performance, and the rules committee views that as a major concern.

Rule 1-3-2 through 5 was completely rewritten with the intention of creating a rule that preserves the intent and spirit of the old rule, but is better suited to products resulting from new technology.

Under the new rule, bats with composite handles and tapers would still be legal. The stricter language applies primarily to the barrel of the bat.

"While the handles and taper are important components of the bat," Hopkins said, "the area that we recognized as more susceptible to abuse is the barrel."

Other rules changes this year aim at increasing convenience for coaches and umpires by simplifying the substitution policy and clarifying several rules.

Rule 1-1-2 now requires coaches to list all known substitutes on the lineup card before the umpire accepts it. Coaches will still be able to add a substitute without a penalty, but this should speed up substitutions and player changes during the game.

A change to Rule 2-16-2 was also made to clarify an existing rule and ease its application for coaches and players. The rule now reads: "A foul tip is a batted ball that goes directly to the catcher's hands and is legally caught by the catcher. It is a strike and the ball is in play."

Similarly, a "last-time-by" rule has been instituted. The new rule states that if a runner correctly touches a base that was missed the last time he was by the base, that last touch corrects any previous base-running infraction. This last-time-by practice is commonly accepted, but is now legally Rule 8-2-6l.

The last two rules changes were approved on recommendation from the NFHS Sports Medicine Advisory Committee. First, in a change to Rule 1-5-8, all hard and unyielding items such as braces, casts, etc., must be padded with a closed-cell, slow-recovery foam padding no less than one-half-inch thick. Knee and ankle braces that are unaltered from the manufacturer's original design/production do not require additional padding.

Second is an update to concussion language that has been added to the rules for all high school sports. The new rule, 3-1-5, puts strict constraints on players who may have suffered a concussion. The rule states that any player who exhibits signs, symptoms or behaviors consistent with a concussion, including but not limited to loss of consciousness, headache, dizziness, confusion of balance problems, must be removed from the contest immediately and shall not return to play before being cleared by an appropriate health-care professional.

A complete listing of all rules changes approved by the committee is available on the NFHS Web site at www.nfhs.org. Click on "Athletics & Fine Arts Activities" on the home page, and select "Baseball."

Baseball is the fourth-most popular sport for boys at the high school level, according to the 2008-09 NFHS Athletics Participation Survey, with 473,184 participants nationwide. The sport ranks third in school sponsorship with 15,699 schools sponsoring the sport.

LISTING OF BBCOR CERTIFIED BATS

<http://www.mme.wsu.edu/~ssl/certified/bbcor/certified.html>