NCAA Accelerated Break-In Procedure
30-September-09

This accelerated break-in procedure is meant to demonstrate how a composite bat will perform during its potential useful life in the field. This test procedure may be used with the NCAA BESR or BBCOR test to quantify the effect that bat usage has on performance and may be used in the certification and compliance testing of composite barrel bats. The procedure is subject to change, at anytime, by the NCAA, in its sole discretion.

Procedure:

1. **Measure preliminary properties of the bat per the NCAA BESR or BBCOR Certification Test Protocol and measure an initial barrel compression (BC_0).**
   Follow the attached barrel compression procedure.

2. **Measure bat performance (i.e. *BESR-i or BBCOR-i, where* (i=1 to denote the first BESR/BBCOR test cycle).**
   Follow the NCAA BESR or BBCOR test protocol.
   Define $BESR_{max}$ or $BBCOR_{max}$ as the average of the six valid hits at the sweet spot.
   If visible damage is observed or the performance limit is exceeded during the first performance test cycle, then stop the test and go to step 8.

3. **Measure barrel compression (BC_{i-j}), where (j=0)**
   Follow the attached barrel compression procedure and calculate the percent change in barrel compression, $\Delta BC_{0,}$ using,

$$\Delta BC_0 = \left(\frac{BC_0 - BC_{1,0}}{BC_0} \right) \times 100\%$$

   If the barrel compression change (ΔBC_0) is greater than 15%, then proceed directly to step 7.

4. **Roll the barrel**
   Follow the attached rolling procedure.
   Increment subscript notation: (j=j+1, where j is used to keep track of the roll process)

5. **Measure barrel compression ($BC_{i,j}$)**
   Follow the attached barrel compression procedure.
   Compute the percent change in barrel compression, $\Delta BC_{i,i}$, according to

$$\Delta BC_{i,j} = \left(\frac{BC_{i,0} - BC_{i,j}}{BC_{i,0}} \right) \times 100\%$$

6. **Repeat steps 4 and 5** (Increase rolling depth by increments of ~0.0125 in.) **until a barrel compression ($\Delta BC_{i,j}$), reduction of at least 5% is achieved.** The target barrel compression reduction should be as close to 5% as possible.

7. **Measure bat performance (i.e. *BESR-i or BBCOR-i*), where (i=i+1, i.e. set value of i to denote performance test cycle)**
   Follow the NCAA BESR or BBCOR test protocol.
   Order of testing axial impact locations may be adjusted by test operator, if necessary.
   Define $BESR_{max}$ or $BBCOR_{max}$ as the average of the six valid hits at the highest performing location from this test cycle or keep as-is from a previous performance test cycle, whichever is greater.
   Check compliance as specified in step 8.

8. **Compliance check**
   The bat fails if:
   - During the performance test, the bat exceeds the performance limit or does not make it through a complete test without visible damage (damage criterion only applies to first performance-test cycle).

   The bat passes if:
   - During a performance test subsequent to the first performance-test cycle, the bat exhibits a sweet spot performance reduction of at least 0.014 in BESR or 0.018 in BBCOR from the maximum bat performance $BESR_{max}$ or $BBCOR_{max.}$

   If the bat has neither passed nor failed, then proceed to step 9.

9. **Measure barrel compression ($BC_{i,0}$)**
   Follow the attached barrel compression procedure and calculate the percent change in barrel compression, ΔBC_i using,

$$\Delta BC_i = \left(\frac{BC_{i,0} - BC_{(i-1),j}}{BC_{i,0}} \right) \times 100\%$$

   If barrel compression change (ΔBC_i) is greater than 15%, then proceed directly to step 7, otherwise proceed to step 4 and reset j=0.

Notes:

1. This procedure is not necessarily all inclusive and is subject to change at anytime, in the NCAA's sole discretion.
2. For purposes of this method, a composite bat uses a fiber reinforced polymer (or similar material whose properties may change with impact) in the barrel portion of the bat.
3. A bat is determined to be broken, during the first performance test only, when a visible crack appears (excluding cracks in the paint or clear coat) or the bat fails the NCAA ring test (as defined in the NCAA BESR or BBCOR bat performance protocol). For subsequent performance test cycles (second, third and so on), damage in the bat is not quantified by the test operator and the bat is tested with respect to the damage criterion until the bat is damaged such that further testing cannot reasonably be accomplished.
4. At the discretion of the test sponsor, the test sponsor may request the test to be continued after failure due to exceeding the performance limit but the bat is still in usable condition. The cost of the continued testing is at the expense of the test sponsor.

Barrel Rolling Procedure

Purpose: To accelerate break-in of composite bats.

Apparatus (as described here or similar such device)

- Two nylon wheels – 1.5 to 3.0 in. in diameter
- Fixture to press wheels into barrel in ~0.0125-in. increments
- Device to roll the barrel

Procedure:

1. Place the barrel of the bat in the fixture with the rollers contacting the bat at 6 in. from the endcap and the 0º orientation (as identified during the Barrel Compression Procedure) facing up.
2. Bring roller in contact with the barrel. Displace the rollers ~0.10 in. for initial rolling or ~0.0125 in. greater than the previous time through the Barrel Rolling Procedure.
3. Roll the barrel to within 2.0 to 2.5 in. of endcap and past the taper (no contact between rollers and bat) as shown in Fig. 1. Roll the bat 10 times in each direction. Popping and cracking sounds during this process are normal. (A different number of rolls can be used at the operator's discretion.)
4. Uncompress the bat.
5. Rotate the bat 90º from initial location and repeat steps 1-4.
6. Rotate the bat 45º from initial location and repeat steps 1-4.
7. Rotate the bat -45º from initial location and repeat steps 1-4.
8. For rolling beyond 0.1 in., increase displacement by increments of about 0.0125 in.

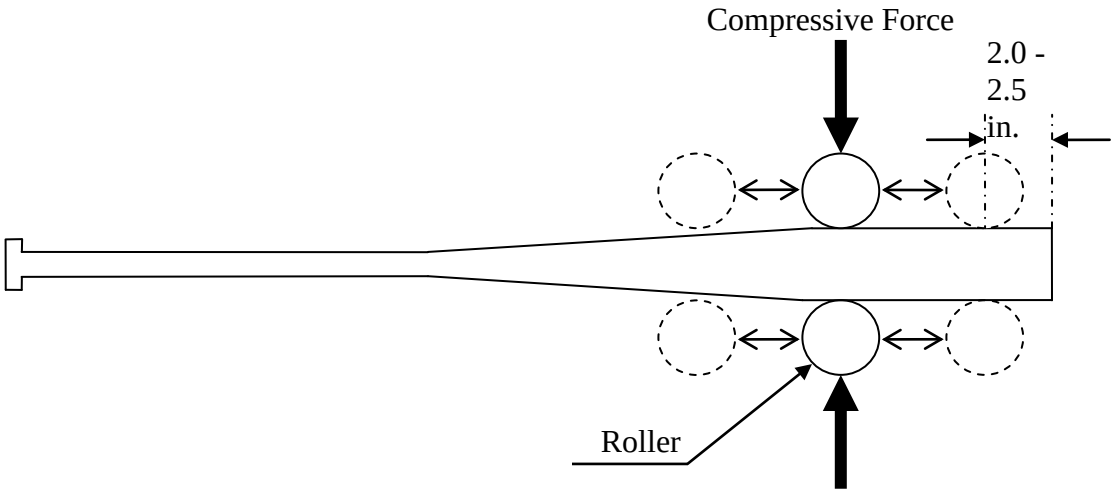

Fig. 1 Rolling parameters

Barrel Compression Procedure

Purpose: To measure the barrel compression.

Apparatus:

- Load frame capable of 1000 lbf
- Cylindrical steel loading noses with 3.86 in. in diameter curvature and long enough to maintain proper contact throughout the test
- Means of measuring load and displacement

Procedure:

1. Mark a side on the barrel of the bat that will be the 0º orientation.
2. Set the force gage to zero.
3. Place the bat in the fixture to make contact at 6 in. from the tip of the endcap as shown in Fig. 2 and with the 0º orientation facing up.
4. Activate the fixture until both cylindrical surfaces are in contact with the barrel of the bat.
5. Compress the bat with 5 to 15 pounds of force.
6. Zero the displacement gage.
7. Compress the barrel 0.01 in. at a rate of about 0.15 in/min.
8. Zero the force and displacement gages.
9. Compress the barrel (an additional) 0.03 in.[1] at a rate of about 0.15 in/min.
10. Record the force (*F*).
11. Release the force.
12. Rotate the bat 90º from the initial rotation. Repeat steps 2 through 11
13. Rotate the bat 45º from the initial rotation. Repeat steps 2 through 11
14. Rotate the bat -45º from the initial rotation. Repeat steps 2 through 11.
15. Compute the barrel compression, BC, from the average of each axis by:

$$BC = \frac{1}{4}\left\{(F)_0 + (F)_{90} + (F)_{45} + (F)_{-45}\right\}$$

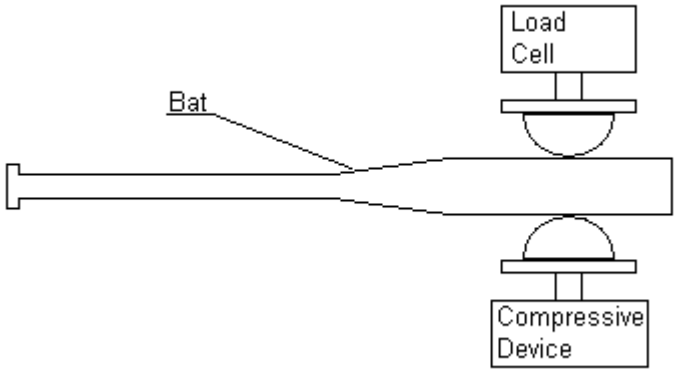

Fig. 2 Compression testing

Note 1: If Force exceeds the load-cell capacity, then the operator may choose to use less displacement (e.g. 0.025 in.). This new displacement must then be used throughout the entire ABI test when measuring barrel compression and be identified in any reports of the tests.