



FRC Bowling Ball Competition

Description: The **Fiber-Reinforced Concrete Bowling Ball** Competition challenges undergraduate student teams to **demonstrate** the effect of fibers in reinforcing **concrete** by forming and fabricating a **concrete fiber-reinforced** element and presenting to an audience of industry professionals. Student will create a fiber-reinforced concrete ball 200 ± 15 (mm) that will be used by the student for bowling and the compressive strength of the ball will be tested.

Rules for the fiber-reinforced concrete bowling ball competition

Student Team:

- A team is limited to two to four students.
- Each team must have a supervising faculty advisor who will see that the team complies with the rules of the competition.

Materials and curing:

1. The bowling ball must be made from a fiber-reinforced concrete mixture.
2. The maximum length of the fiber is 60 mm.
3. No other type of reinforcement is allowed.
4. Only the Mixture materials listed in the Design Example can be used.
5. No other Mixture materials are allowed.
6. Not all the materials listed are required to be used.
7. Filling of honeycombed surfaces after casting is allowed.
8. Filling materials must be selected from the exact same materials used in the original concrete mixture.
9. Paints are allowed, though are not required.
10. The bowling balls may have layers or be solid (homogeneous) or core-filled.
11. Report the materials used and the total volume.

Bowling ball specimen:

1. An unpainted space 60 mm wide horizontally and 15 mm in height is required.
2. The unpainted space is provided for the team name and ball number.

Bowling ball competition:

- Each team shall bring 2-balls for the competition and testing at the convention

Specifications Test: (10% of each Category)

1. Each team must submit their forms and files for consideration for prizes.
2. Safe and professional behavior is expected in the competition, During the competition, the judges will evaluate the teams for their behavior, Disruptive and unsafe behavior will be penalized in the scoring of the team.

Mass Test: (10% of each Category)

1. Each bowling ball mass shall not exceed $5.5 + 0.5$ kg.
2. If the ball weighs more than $5.5 + 0.5$ kg, it shall be disqualified.

Diameter Test: (10% of each Category)

1. The bowling ball shall be spherical.
2. The bowling ball shall measure 200 ± 20 mm diameter.
3. Each ball must have a flat spot measuring 20 to 25 mm in diameter to stabilize the ball.
4. If any of the diameter measurements of the bowling ball are greater or less than the design standard tolerance, the ball shall be disqualified.
5. If a team fails both tests with both balls, the head judges may allow the team to continue in the competition but are not required to do so.

Bowling Test: (30% of each Category)

1. The bowling apparatus (ramp and alley) will be provided at the competition.
2. One and only one team member can be identified as the "Team Bowler" and another team member will retrieve the bowled ball and return the ball to the Team Bowler.
3. Under no circumstances is the ball to be thrown, launched, or catapulted down the alley toward the pins.
4. No practice rolls will be given to any team or individual prior to the test.

Drop Test: (20% of each Category)

We use a free-fall drop test to drop a FRC Bowling ball of $200 \text{ mm} \pm 20 \text{ mm}$, onto the test base.

The ball should have a total weight of $5.5 \text{ kg} + 0.5 \text{ kg}$.

To perform this test, we use the following procedure:

1. Place the ball with its painted center matching the given, marked height (**750 mm**).
2. Mark the point that will hit the base to ensure that it is under repeated hits.
3. Allow the ball to fall freely and impact the base at the marked point, without attempting to catch any rebound of the ball.
4. Record the number of drops to a major crack or spall based on referees' judgement.

Load Test: (20% of each Category)

1. A compressive machine of the CE department construction lab will be used in the load test, it is operated and controlled by the department assistant.
2. This load is considered the Final Deformation Load Test Score to be carried through to the Evaluation Phase of the competition.

Awards:

- All participants will receive a Certificate of Participation.
- The winners will be awarded a trophy.

Notes:

- The curing for each ball must not exceed 7-days.
- Every ball must be created under supervision of the supervisor, who will see that the team complies with the rules of the competition.
- The Excel Design sheet must be filled and submitted before the competition starts.