



FIBER REINFORCED CONCRETE BOWLING BALL COMPETITION MANUAL

APPLY NOW

26 FEBRUARY 2025 AT 10.00 AM



100 MT. STREET, NEAR FIKHRAZ BAZ (SQUARE).

Fiber Reinforced Concrete Bowling Ball Competition Manual

1 Competition Overview

The Fiber-Reinforced Concrete Bowling Ball Competition is designed as an academic challenge for undergraduate student teams to explore and showcase the reinforcing effects of fibers in concrete. Participants must design, fabricate, and present a fiber-reinforced concrete bowling ball with a diameter of 200 ± 20 mm. This competition not only provides an opportunity for students to engage with industry professionals but also serves to assess the technical skills they acquire in their engineering coursework. As part of the evaluation, the fabricated concrete ball will undergo a compressive strength test (Load Test) to measure its structural performance. In addition, the ball's durability will be assessed by dropping it from a specified height.

2 Student Teams

- **Team Limit per University:** Each university may field up to three (3) teams.
- **Team Composition:** Each team must comprise two (2) to four (4) undergraduate students.
- **Faculty Advisor:** Every team must have a designated faculty advisor, responsible for ensuring that the team adheres to all competition guidelines and deadlines.

3 Jury Selection

The panel of jurors who will evaluate the competition is appointed by the **ACI Kurdistan Chapter / Student Activities**. The jurors' decisions are final and based on the criteria outlined in this manual.

4 Materials and Curing

Fiber-Reinforced Concrete: Each bowling ball must be made from a fiber-reinforced concrete mixture.

- **Fiber Length:** The maximum permissible fiber length is 60 mm, and maximum diameter of 0.5 mm.
- **Reinforcement Restrictions:** No other form of reinforcement (e.g., rebar, welded wire mesh) is allowed.
- **Approved Materials:** Only materials specified in the Design Example of Excel sheet (provided by the competition organizers – attached with this manual) may be used.
- **Prohibited Materials:** No additional or substitute materials outside the Design Example are permitted.
- **Optional Materials:** Teams are not required to use all materials listed in the Design Example but may do so if it benefits their design.
- **Surface Repairs:** Filling of honeycombed surfaces after casting is permitted.
- **Filling Materials:** Any filling materials must be identical to those used in the original mixture.
- **Painting:** Painting the bowling ball is allowed but not mandatory.
- **Material Reporting:** Each team must document the exact materials used and the total volume of the finished bowling ball, using Excel Sheet.
- **Curing Period:** The curing period for each bowling ball must not exceed 10 days.
- **Supervision:** Every ball must be fabricated under the direct supervision of the faculty advisor to ensure adherence to the competition rules.
- **Excel Design Sheet:** Teams must complete and submit the official Excel Design sheet prior to the start of the competition.
- **Any material** that solely provides voids for weight reduction, without contributing to the structural reinforcement of the ball, may be used.
- **If the fiber length or diameter** does not fall within the specified range, the bowling ball will be disqualified from ranking yet still allowed to continue in the competition.

5 Bowling Ball Specimen Requirements

- **Identification Space:** Each bowling ball must include an unpainted space measuring 60 mm (width) × 15 mm (height).
- **Labeling:** This unpainted section must clearly display the team's name and ball number.

6 Bowling Ball Competition Rules

Number of Balls: Each team must bring two (2) bowling balls to the competition.

Design & Mix Report: Teams must submit a detailed report outlining their mixed design, fabrication process, and any relevant calculations or observations.

6.1 Specifications Test (10%)

- **Submissions:** All required forms, and documentation must be submitted to the team to be eligible for any prizes.
- **Professional Conduct:** Teams must exhibit safe and professional behavior throughout the event.
- **Conduct Penalties:** The judges reserve the right to penalize disruptive or unsafe behavior by deducting points from the team's final score.

6.2 Mass Test (10%)

- The bowling ball shall have a standard mass of 5.5 kg, with an allowable maximum limit not exceeding 6 kg.
- If the bowling ball weighs 5.5 kg or less, the team will receive 10%. and if the ball weight is 6 kg, the team will receive 0%. For any weight in between, linear interpolation is adopted.
- **Disqualification:** Any ball heavier than the specified range will be disqualified.

6.3 Diameter Test (10%)

- **Sphericity:** The bowling ball must be spherical 5%.
- **Diameter Range:** The ball's diameter must measure 200 and allow range to be not less than 180 mm and not more than 220 mm in diameter.
 - If the ball's diameter is exactly 200 mm, the team will receive 5%. If the diameter is not 200mm but within range for diameters between 180 mm and 220 mm, the awarded percentage will be determined by interpolation between (0% and 5%).
- **Flat Spot:** Each ball must have a flat spot measuring 20–25 mm in diameter for stabilization.
- **Tolerance Violation:** If the ball's diameter is outside 200 ± 20 mm, the ball will be disqualified.
- **Multiple Failures:** If both entries from a team fail diameter requirements, the head judges may—but are not obliged to—permit continued participation.

6.4 Bowling Test (20%)

- **Bowling Apparatus:** A ramp and alley will be provided on-site.
- **Team Bowler:** Exactly one team member shall serve as the “Team Bowler,” with another member responsible for retrieving the ball.
- **Prohibited Techniques:** Under no circumstances shall the ball be thrown, launched, or catapulted down the alley.
- **Practice Rolls:** No practice attempts are allowed before the official test.
- **Score procedure:** The number of fallen (bowling pins) in 2 rounds will be recorded as each fallen bowling pin for 1%.

6.5 Drop Test (30%)

- The drop test evaluates the durability of the bowling ball.
- Dimensions & Weight: The ball must measure 200 ± 20 mm in diameter and weigh 5.5 ± 0.5 kg.

Test Procedure:

- ❖ Mark the impact point to maintain consistency in subsequent drops.
- ❖ Allow the ball to free-fall onto the base; do not interfere during the drop or rebound.
- ❖ Record the number of drops until a major crack or spall is observed, as judged by the referees.
- ❖ The team with maximum number of drops (decided after all teams finishes), the team will receive 30%. For any outcome in between 0 and maximum number of drops, the percentage will be determined through interpolation between 0% to 30%.

6.6 Load Test (20%)

- Machine Setup: A compressive testing machine in the Civil Engineering Department laboratory will be utilized for this test.
- Scoring Metric: The load at which significant deformation or failure occurs is recorded as the Final Deformation Load Test Score, contributing to the final competition score.
- If the ball achieves the maximum load (decided after all teams finish), the team receives 20%. For values in between, the percentage is determined through interpolation between 0% to 20%.

7 Awards

- Certificates: All participating teams will receive a Certificate of Participation.
- Award for Winners: The competition winners will be awarded a trophy in recognition of their achievement.

8 General Notes

- All rules, tests, and evaluations are subject to final interpretation by the appointed jurors and the competition committee.
- Teams are strongly encouraged to double-check their materials, dimensions, and calculations to avoid disqualification for noncompliance.
- Adherence to safety protocols and professional conduct is mandatory.

9 Contact Information

For any inquiries regarding the competition rules, materials, submission deadlines, or clarifications, please contact:

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By participating in this competition, all teams acknowledge and agree to comply with the rules, regulations, and decisions established by the ACI Kurdistan Chapter and the designated juries.