

2025 ASCE Mid-America Student Symposium

CONCRETE BOWLING COMPETITION RULES

All requests for information and clarifications should be sent to:
nebraskasymposium.2025@outlook.com

OBJECTIVE

Teams will create and design a bowling ball within the requirements listed below. Each will be scored based on the performance of each of the tests done.

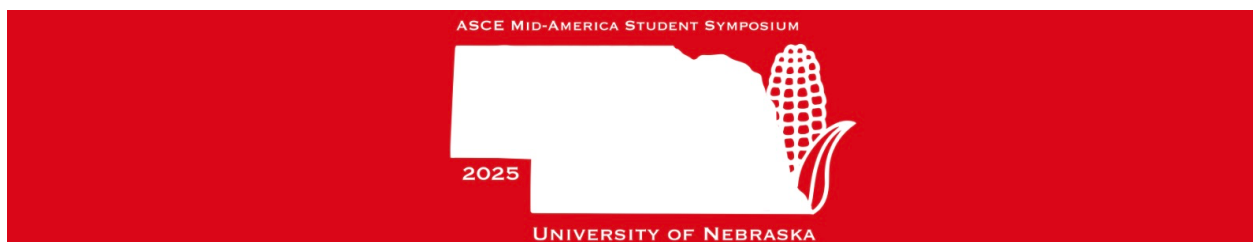
PARTICIPATION GUIDELINES

Allowing for **ONE** team of **3-8 people**, all members from the same school.

- Each team must have at least **one supervising faculty member**.
- At least **TWO members, maximum FIVE**, must attend the competition and compete.

EVENT DESCRIPTION

- Team leader must check-in with a prepared list of all team members participating in the Bowling Competition.
- Each team must have 2 bowling balls.
- Each team must bring 2 copies of the mix design.
- A game consists of 10 frames with the intent of knocking down 10 pins per frame.
- A member has 2 tries to knock down all 10 pins.
- If a member starts a frame, they must finish it.
- The number of times bowled must be evenly split among each bowler (ex: 5 bowlers compete in two frames each).

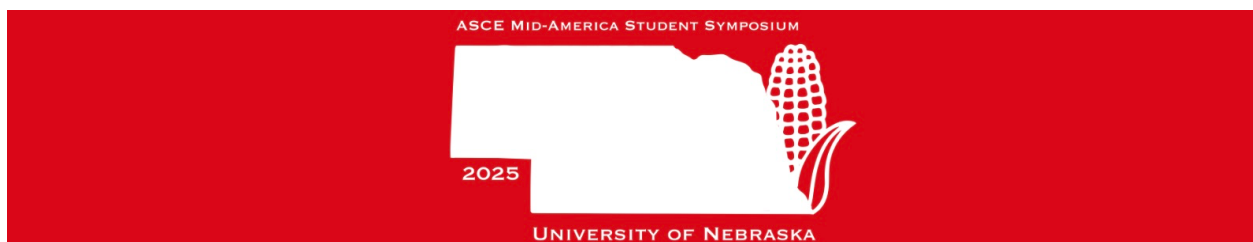


DESIGN REQUIREMENTS

- The bowling ball must be made of concrete. No resins or epoxies may be used.
- Both balls must be as spherical as possible. One ball will be required to roll down a bowling alley lane, while the other will be used for toughness testing.
- The ball target mass is 5,200 grams, but for competition eligibility, the ball must be between 4,800-5,600 grams.
- The target diameter of each ball is 215 mm, but for competition eligibility, the ball must be between 200-230 mm.
- If needed teams may refer to the ACI concrete bowling rules for specific design details.
- A mix design must be submitted by February 13, 2025, to nebraskasyposium.2025@outlook.com.
- Pigment powder, paint and other mixed concrete layers are allowed for the aesthetics of the ball.
- The aesthetics of the two balls should follow a clear and cohesive theme.
- If these design requirements are not met, the team is disqualified.

FIBER REINFORCEMENT

- The bowling ball must be made with fiber reinforcement. No other type of reinforcement is allowed.
- Fibers must be commercially available and unaltered after receiving from the manufacturer.
- All fibers must be the same length between.
- There is no limit to the amount of fibers that may be used within the ball.



SCORING (100 pts.)

Each team will be judged on the following criteria out of a total of 100 points.

Testing Details:

- At the symposium, each bowling ball will be tested in mass, diameter, toughness, and bowling performance.

Design Requirements (30/100)

- Teams that meet ALL design requirements as stated above will receive full points in this category.
- Mix design submitted on time to nebraskasyposium.2025@outlook.com by due date of February 13th, 2025.

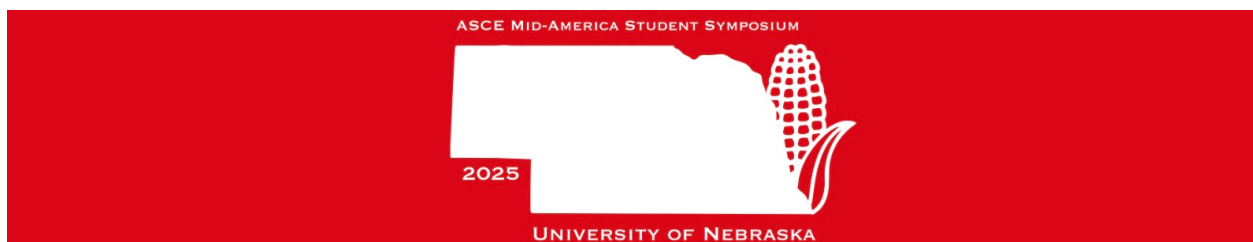
Mass Test (10/100)

- The **target mass** is 5,200 g +/- 400 g. All points for the mass test will be **neglected** if they are measured to be outside of the allowable mass range.
- The mass test includes two subcategories:
 - Precision (5 points): how close the masses of the two bowling balls are to one another.
 - Accuracy to **target mass** (5 points): how the average mass of the two bowling balls compare to the target mass of 5200 grams.

Diameter Test (10/100)

Bowling balls should have a spherical shape. The diameter will be measured 3 times from different angles.

- The **target diameter** of each ball is 215 mm +/- 15 mm. All points for the diameter test will be **neglected** if they are measured to be outside of the allowable diameter range.
- The diameter test includes two subcategories:
 - Precision (5 points): how close the diameters of the two bowling balls are to one another.
 - Accuracy to **target diameter** (5 points): how the average diameter of the two bowling balls compares to the target diameter of 215 mm.



Toughness Test (10/100)

- One of the two bowling balls brought to the competition will be placed in a testing apparatus by the judges for controlled loading.
- All toughness points will be **neglected** if any displacement load is less than 3,000 pounds or more than 60,000 pounds, or an average of the loads is less than 5,000 pounds or more than 50,000 pounds.
- The judges will set a constant displacement rate for the test between 5.00 and 12.50 mm per minute on the day of the competition. This load will be continually applied to the ball.
- The load will be recorded at every 5 mm of crosshead displacement between 0 and 25 mm.
- The target and highest score are obtained when the load at all 5 deflections is constant (same), which results in a coefficient of variation (COV) of 0%. The COV is the standard deviation of the 5 loads divided by the average of the 5 loads, and a 0% COV exemplifies an ideal elasto-plastic behavior from the fiber-reinforced concrete matrix.
- See Figure 1 below for clarification on loading.

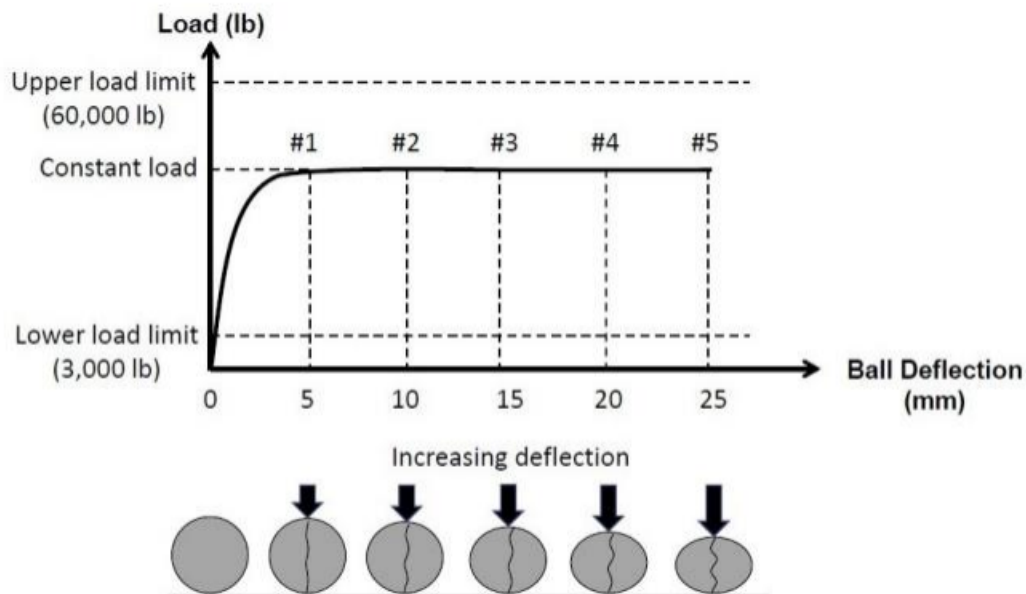


Figure 1. Schematic of the “toughness” test and 5 load readings; graphical representation of 0% COV and a perfectly elasto-plastic response.

Bowling Performance (30/100)

- One of the two bowling balls brought to the competition will be used in the bowling portion of the competition.
- Bowling 10 frames with 2 attempts per frame.
- If a member begins a frame, they must finish it.
- One extra bowl will be made in the case of a spare in the last frame.
- Two extra bowls will be made in the case of a strike in the last frame.
- Only ONE ball shall be used for bowling.
- Standard bowling pins are to be used.
- The lane will be 8 m long and 1 m wide. No ramps will be used, but bumpers will be included.
- Stepping over the foul line will result in zero points for that bowl.
- Scoring will be comparative, meaning the team with the overall highest bowling score will receive the maximum number of points and each subsequent ranking will receive a corresponding fraction of the maximum points.

Aesthetics (10/100)

- Follows a cohesive theme that is identifiable without explanation.
- Looks neat and well put together.
- Pigment powder, paint and other mixed concrete layers are allowed.
- If the final bowling ball is not complete by the time of judging, your team will receive **no points** for all aesthetics.
- This category will be judged solely on the judge's personal discretion.

SCORING SUMMARY TABLE

Category	Subcategory	Points
Design Requirements		/30
Mass	Precision	/5
	Accuracy to Target	/5
Diameter	Precision	/5
	Accuracy to Target	/5
Toughness		/10
Bowling Performance		/30
Aesthetics		/10
TOTAL		/100 pts.

