ACI Missouri Concrete Bowling Ball Competition Rules - 2024

Objectives

The objective of this competition is to demonstrate the benefits of lightweight aggregates and fiber use in concrete, to facilitate interaction between industry professionals and student members, and to enable students to earn some money towards competing at ACI National Conventions. Each team will design and fabricate a fiber-reinforced bowling ball. These are a simplified version of the National Competition Bowling Ball Rules, held in the Spring 2023 in San Francisco, CA, and generally held every two years.

Schedule

The competition will take place at The HUB, 17065 N Outer 40 Rd, Chesterfield, MO 63005, on Friday, November 15th, starting at 5 pm. The results of the competition will be evaluated with the winning teams awarded at the conclusion of the event.

Competition and Prizes

The Local Competition has two prize categories: Student Team and an overall winning team. Fiber-reinforced bowling balls will be tested for size and mass, and their ability to be used successfully as bowling balls. The winning Student team will be awarded a prize of $500, and the second placed Student team will receive $250. The overall winning team, including non-Student teams, will be awarded "The ACI MO Concrete Bowling Ball Traveling Trophy."

Teams

Only 2 teams per school, company or family are eligible for this competition.

In case joint teams are formed between schools, companies or families, this team will count towards the allowed number of teams for each of those entities.

Everyone is allowed to join a team.

One person is the designated contact for the team.

At least one individual must be present at competition for each of the bowling ball tests.

Every team must submit a team name. Judges may assign a different team name if deemed necessary.

Teams need to register their participation enrolling on the ACI Missouri website (acimissouri.org) before October 31st, 2024, 11:59 pm CST.

Bowling Ball Identification

Ensure that your team's bowling balls can be individually and uniquely identified, both from each other and from other team's bowling balls.

Teams can use letters, symbols, marks, and coloring for identification.

All identification is to be aesthetically pleasing and must not be offensive.

Unacceptable markings and unacceptable depictions on the bowling balls will be penalized and may disqualify the team and their school, company or family from further competitions.

The head judges have final determination regarding what is unacceptable.

Bowling balls may be painted. Epoxy-based paints are not allowed.

Bowling Ball Materials

Teams design and construct bowling balls from a (lightweight) concrete mixture. Any other structural material (plastic, metals, etc.) is not allowed, except for fiber reinforcement.

A mix design sheet (mass of material per unit volume of concrete) must be brought to the competition for verification.

Patching, filling, or repair of honeycombed surfaces after casting is allowed.

Materials to correct the honeycombed surfaces must be selected from the exact same materials used in the mix design sheet.

Fiber reinforcement is recommended to avoid splitting of the bowling balls during bowling. No other reinforcement is allowed.

The bowling ball mass can be met with different materials and different densities that are not a concrete material or a fiber reinforcement.

These lightweight materials can be mixed or used within the bowling ball to meet the mass requirement. Some examples are: The lightweight materials can be grouped together as a centered core. The lightweight materials can also be homogeneously distributed within the mixture. The bowling balls may have multiple layers of different densities or one core with a different density.

Lightweight aggregates (both lightweight sand and lightweight coarse aggregates), as well as expanded polystyrene beads are examples of an acceptable homogeneously distributed lightweight material. A balloon filled with expanded polystyrene beads is an example of an acceptable core using two lightweight materials.

The use of lightweight materials is optional, but the mass requirement will not be met if a large diameter is chosen.

The lightweight materials used are to be listed on the mix design sheet with the respective volumes for core and distributed other materials.

Curing

Curing shall be at atmospheric pressure.

The curing temperatures shall not exceed the boiling point of water.

Use of a standard moist-curing room is permitted.

Judging

The judges retain the right to use any means or methods they feel are necessary to verify and enforce the rules and requirements of the competition.

The judges retain the right to interpret, modify, or eliminate any section or sections of these rules as special circumstances arise.

Bowling Ball Tests and Competition

Each team shall bring to the competition: up to two bowling balls and a copy of their mix design sheet.

If a team brings two bowling balls, the judges will inspect both balls for compliance with size and mass requirements. The team selects only one ball to perform the bowling after the judges' inspection. Balls cannot be replaced once bowling has started, even if the bowling ball gets damaged.

Teams with bowling balls outside the size limits of the test will be disqualified from the competition and are ineligible for victory.

The head judges may allow the team with balls outside the range or limits to continue in the competition but are not required to do so.

Continuation in the competition does not mean the team is eligible for victory.

Modification of bowling balls shall not be permitted once they have been deemed compliant with size and mass requirements.

Mass Test

Each bowling ball mass shall be less than 6000 g (6 kg - 13.227 lbs).

The mass of each ball will be measured and documented by the judges for adherence to the bowling ball mass consistency requirements set forth in these rules.

All balls will be weighed using the same scale of the judges' choice.

If a bowling ball exceeds the maximum mass, a penalty will be applied per increment of 50 g (0.11 lbs) the bowling ball exceeds the mass requirement following this table.

MASS IN EXCESS OF 6000 G	PENALTY (PINS)
1-50 G	2
51-100 G	5
101-150 G	10
EACH ADDIITONAL INCREMENT OF 50 G	+ 5 pins

The means that a ball with a mass of 6005 g will incur a 2 pin penalty, and a ball with a mass of 6175 g will result in a 15 pin penalty.

Diameter Test

The bowling ball shall be as spherical as possible. Cylinders are not accepted.

The bowling ball shall measure maximum 225 mm diameter (8.858 in.), in the widest direction if the ball is not fully spherical.

Each ball will be measured along three different axes arbitrarily selected by the judges for adherence to the bowling ball diameter consistency requirements set forth in these rules.

Any ball that exceeds the diameter requirement will be disqualified from the competition, unless quick remedial action is possible on-site.

We strongly advise to aim for a smaller diameter than what is specified, to avoid issues during competition. Fulfilling the mass requirement also becomes a lot more difficult with diameters close to the limit (e.g.: designing concrete which meets the mass requirement at the maximum allowed diameter would result in a specific gravity of the mixture = 1.00).

Bowling

The ball selected by the team for bowling will be used by the team to "roll" and score two, three or four frames of bowling (dependent on the number of entries).

The bowling apparatus (ramp, lane, and pins) will be provided at the competition.

The ramp is approximately 1470 mm long, 670 mm wide, and 620 mm in height to achieve a reasonable ball speed.

The bowling lane will be approximately 1000 mm (39.3 in.) wide and 4000 mm (157.5 in.) long or longer.

Ten standard-sized bowling pins will be used.

During the day of the competition, the judges will decide the following details based upon the total number of teams for the competition:

1-Pin arrangement and spacing (between 8 and 12 inches between direct pin neighbors), 2-How many rolls per frame (2 rolls anticipated, directly following each other), and 3-How many frames will be bowled (between 2 and 4, dependent on number of teams)

Horizontal adjustments to the ramp for aiming the ball are allowed for each team prior to each roll. Teams are not allowed to adjust the ramp after their final roll for each frame.

Further, judges will have the right to control the time for the bowling by imposing a time limit for the bowling portion of the competition to ensure that not too much time is spent aiming or adjusting for the ball roll or a maximum amount of time to accomplish the number of rolls for the chosen number of frames.

In this case and if the total allowed number of rolls are not completed at the expiration of the allowed time, the score attained during the time limit will be the team's bowling score.

One practice roll with each bowling ball will be given to any team prior to the bowling. However, no pins will be set during practice rolls. Markings for the pins will be present.

Any additional practice rolls on competition equipment will result in team disqualification.

Under no circumstances is any ball to be run with, walked fast with, thrown, launched, or catapulted anywhere within the venue.

Unacceptable behavior with and without the bowling balls will be penalized and may disqualify the team from further competitions.

The head judges have final determination regarding what is unacceptable.

The team bowler will position the ramp, and the test ball at the top of the inclined ramp and release it down the ramp onto a flat, non-oiled, hard-surfaced lane.

The inclined ramp must be used to "roll" the ball. The bowling ball is released on the ramp, not pushed.

Once the bowling ball is released and begins its descent down the incline, the rolling ball may not be chased after or interrupted.

If the ball rolls too far off the lane prior to striking the pins, it is considered a gutter ball and no pins will be scored for that roll.

The resulting "knocked down" pin count will be recorded as the score for that frame.

The judges will be responsible for setting the pins and recording the score.

Judges will assign the order of bowling.

Scoring

Standard bowling scoring will be followed, with (an) extra roll(s) if a spare or strike is hit in the final frame.

The team with the largest score at the completion of the number of frames selected for the competition is the winner of the competition.

If the score is tied, the ramp will be placed 250 mm (9.8 in.) backward, and each first-place tied team will have one roll. The team knocking down the most pins in this tiebreaker wins. If teams are still tied for first place, the ramp will be placed another 250 mm backward and this process will be repeated until a winner is determined. If none of the teams knocked down a single pin during the tiebreaker, the ramp will be advanced 250 mm closer to the pins and the process will be repeated.

Bowling scoring rules:

Strike

If you knock down all 10 pins in the first shot of a frame, you get a strike.
How to score: A strike earns 10 points *plus the sum of your next two shots.*

Spare

If you knock down all 10 pins using both shots of a frame, you get a spare.
How to score: A spare earns 10 points *plus the sum of your next one shot.*

Open Frame

If you do not knock down all 10 pins using both shots of your frame (9 or fewer pins knocked down), you have an open frame.
How to score: An open frame only earns the number of pins knocked down.

The Last Frame

The last frame is a bit different:
If you roll a strike in the first shot of the last frame, you get 2 more shots.
If you roll a spare in the first two shots of the last frame, you get 1 more shot.
If you leave the last frame open after two shots, the game is over and you do not get an additional shot.
How to Score: The score for the last frame is the total number of pins knocked down in the last frame.