2024 Gulf Coast ASCE Student Symposium
Prestressed Miniature Beam Competition

March 7-9, 2024

Overview:
Teams will compete to build a miniature prestressed concrete beam using unconventional materials. This competition is meant to test students' innovative problem-solving skills in addition to a fundamental understanding of structural design. All beams will undergo a list of evaluations including determining the amount of prestress force that has been applied to the beam, and maximum load capacity in shear and flexure. The students will be given all the materials required to construct the beam as well as some tools that they will be able to use at their discretion to assist in determining prestressing force. The students will be allowed to use creative problem-solving when determining the cross-section of the beam while remaining within the geometric constraints provided. All beams will be submitted to the judges to confirm geometric constraints have been respected and to determine prestress force and load capacities. Each team will be required to submit a short report showing estimated prestressing and moment capacity.

Teams:
Each school can have one team, and only one beam will be scored. There is no maximum number of people allowed for building the beam, however, only three people are allowed to be present for testing. Each team should follow their school's safety guidelines and must follow any meeting capacity restrictions when designing and building the beam.

Competition Schedule:
The Prestressed Miniature Beam competition will take place at the 2024 Gulf Coast ASCE Student Symposium. Each school will build the beam onsite at the symposium. The beams will be constructed on the first day of the competition and all testing and scoring will be conducted on the second day of the competition. The judging of the beam will take place at The **University of New Orleans**. The finalized report will need to be submitted at the time of testing/scoring of the beams. Judges will review these reports prior to the awards ceremony. Results will be announced at the awards ceremony, with full results being made available to all schools at the conclusion of the conference.

Materials:
Below is a list of materials that can be used to construct the beams. All materials will be provided to the teams at the symposium. Any materials used other than those supplied at the symposium will result in disqualification of the team.
- Wood forms
- Styrofoam to modify cross-section
- Bass strings
- String anchorage
- String tensioning device
- Concrete

Construction:
The beams must be constructed and cast in full on the first day of the competition. Only materials provided by the competition sponsor may be used for beam construction. The beam must use the Bass string to act as the prestressing strand/reinforcement in the beam. The beams must conform to the maximum depth, width, and length of the formwork provided. Students may use various tools (measuring device, guitar tuner, glue, etc.) at their discretion to aid in constructing the beam. Concrete must be poured by 3 PM on the first day of the competition.

Beam Dimensions:
The constructed beam must not exceed the formwork dimensions provided by the competition sponsor. The beams are allowed to be smaller than the formwork provided in depth and width, but the length of the beam must maximize the full length of the formwork.

Constraints:
1. The teams must only use the materials and tools provided at the competition.
2. Beams must maintain the length of the formwork provided. Beams shorter than the provided formwork will be disqualified.
3. All concrete must be poured by 3 PM on the first day of the competition to allow ample time for the concrete to cure.
4. Member size is constrained as follows:
a. No greater than 12” in width
b. No greater than 6” in height
5. The beam shall stand freely on a flat surface.
6. Beams will be required to maintain a maximum of 1” of bearing on each end.
7. Beams will be constructed in such a manner that will allow for the member to be loaded either directly on top of the beam (flat top surface required) or using a strap provided by the competition sponsor.
8. Concrete mix, and amount of mixing water will be predetermined by competition judges. A test cylinder will be cast to determine the compressive strength of the mix at the time of testing.

Loading:
The beams will be loaded at 1” from the edge of the bearing surface until shear cracks develop in the beam. The judges will visually determine when shear cracks begin to develop. The loading will be done in predetermined increments. The beams will then be loaded at midspan until failure. Failure will be determined once one of the below criteria happens.

- Beam fails to hold weight added for more than 5 seconds.
- Deflection of more than L/360 occurs.

Judging:
Judges for the Prestressed Miniature Beam competition are appointed by the host school **(The University of New Orleans).** Judges will make the final determination on compliance with the rules outlined in this handout and penalties for the rule violations. Judges also must make interpretations of the rules in the scenario that questions arise. The decision of the judges will be final, and no appeals will be considered.

Scoring:
Teams will be ranked in order of Lowest Overall Score. Each team will be ranked in descending order for each of the two test categories (prediction of prestressing, prediction of load at midspan for failure, load achieved at midspan for failure). The team with the lowest score at the end of the competition will win.