Overview
The Balsa Wood Bridge Competition offers participating teams the opportunity to demonstrate knowledge of structural design principles in the construction of a two-span balsa wood bridge. Students will design and build a bridge with required dimensions, materials and performance specifications. The bridges will have a skew angle of 20° and a vertical slope of L/72. The loading condition will be a moving live load consisting of a 12-lb ball (4" dia.) traveling down the length of the bridge on a guide track. Bridges will be constructed with two parallel tracks to accommodate live load testing of first the left lane, and then the right lane. Prior to testing, teams will submit their technical report and the bridges will be evaluated for compliance with the specifications.

Objective
The objective of this competition is to design and build a two-span skew bridge that conforms to the specifications. Bridges are to be designed and built to safely carry the moving live load from the top to the bottom while maintaining strength and stability of all members at all times. The bridges will be tested on a flat surface with two abutments and a mid-span pier that have 0.5" bearing widths. To accommodate the L/72 slope, one abutment will be elevated 0.5" and the pier will be elevated 0.25". The 12-lb ball will be placed at the highest elevation and first released from the left lane. If the bridge safely carries the load with no damage, the ball will again be placed at the highest elevation and then released from the right lane. Bridges passing both tests will be eligible to win the contest based on the weight of the bridge and the quality of the technical report.

Eligibility
Each university may have one team with up to four students, one of whom may be a graduate student. Each team will have a captain who is responsible for submitting the bridge and a paper copy of the technical report during registration. Each team may only submit one bridge. All submitted bridges must meet all design specifications. Compliance evaluation will be conducted at least 24 hours before testing. Team captains will be notified by cell phone if a compliance issue has been identified. Failure to meet a specification requirement will result in disqualification if not remedied at least 1-hour prior to scheduled testing.

Submittals
Electronic version of the Technical Paper due March 10, 2017 at 11:59 p.m. EST to 2017asce@fau.edu (Subject: Balsa Wood Bridge Technical Paper); Bring specimen to assigned testing time.

All technical reports and bridges must be submitted upon arrival to the conference at the time of registration. Reports must be bound or stapled and presented on 8.5" x 11" paper. Bridges must have the name of the university printed in ink along the length of one or more bridge members.
**Dimension Specifications**
- Overall length of the bridge shall be 36". (Total length ~39.25" with skew angle, all members inclusive.)
- Overall width of the bridge shall be 9". (Measured side to side all members inclusive.)
- Overall depth of the bridge shall not exceed 4". (Measured top to bottom excluding the guide tracks.)
- Level support widths shall not exceed 0.5". (Both abutments and the pier have 0.5" bearing widths.)
- Continuous bridge deck with a minimum thickness of 0.125".
- Two sets of parallel guide tracks over the full length of the bridge.
- Both guide tracks shall be 0.5" x 0.5" x 36" with a 0.75" clear gap between the members.
- Outside edge of guide track shall be no more than 1.5" from the longitudinal edge of the bridge deck.
- Dimensions of gusset plates (if used) shall not exceed 1" x 1" x 0.125".
- Dimensions of splice plates (if used) shall not exceed 1" x 2" x 0.125".

**Materials Specifications**
- **Wood** - Only Medium to Medium-Hard grade balsa wood with dry densities between 7.6 and 12 lbs/ft$^3$ are to be used. Balsa wood of A, B or C grain types may be used. The minimum thickness of all members must be 0.125" ± .025". The maximum thickness of all members must be 0.5" ± .025". Specialized or treated balsa woods are not allowed.
- **Glue** - Bridges must be constructed using only one type of glue throughout. The glue must be one of the following:
  - Elmer's
  - Carpenter’s
  - Interior Wood Glue

**General Specifications**
- Except for the guide tracks, structural members shall not project above the plane of the bridge deck.
- Structural members shall not project below the plane of the three supports.
- Maximum number of structural members intersecting at a single point is six.
- Excessive glue assisting with the strength and stability of the bridge is not allowed.
- Glue is only to be used to connect members, joints and plates.
- Paint, stain or any other coating is not allowed.
- Laminating the wood is not allowed.
- Actual member dimensions must be within a 0.25" of the CAD drawing dimensions.
Technical Paper
The technical paper shall be 750-1000 words in length and consist of:

1. Introduction
   a. Name of University.
   b. Names of team members.
   c. Captain’s name and cell phone number.

2. Material Documentation
   a. Quantity and dimensions of all balsa wood used in construction.
   b. Name of wood glue used in construction.
   c. Purchase information of all materials. (Include photocopies of the receipts.)

3. Design Methodology and Construction
   a. Explanation of all design assumptions used in the design.
   b. Discussion of alternative designs considered.
   c. Analysis procedures used to determine the member locations and sizes.
   d. Discussion of the construction sequence.
   e. Discussion of any problems encountered and overcome.

4. Figures
   a. CAD plan view with all dimensions to scale.
   b. CAD elevation view with all dimensions to scale.
   c. CAD connection details with all dimensions to scale.

Load Testing
The order of testing will be determined by the judges. Teams will be notified in advance of the testing order. The team captain must be present at the time of testing. Other team members may be present, but it is not required. The team captain will place the bridge on the loading platform. No adjustments can be made to the bridge after it has been placed for testing.

Loading will be conducted by the judges. The 12-lb ball will be rolled down the deck twice. Looking down the length of the bridge from the high end, the ball will first be rolled down the left side. For a successful test, the ball must travel on the guide track the entire length without causing any permanent damage to any component of the bridge. If the first test is successful, the right side will then be tested.

Judging
There will be a minimum of three judges for the competition. It will be the judges’ responsibility to evaluate the teams fairly and consistently. The teams will be evaluated based on the criteria outlined in the scoring section below. The judges’ ruling will be final.

Scoring
Only the teams with the two successful load tests will be given an overall score. For each of these bridges, the judges will weigh the bridge and evaluate the team’s technical report. The overall score will be based on the weight of the bridge and the quality of the technical report. The team with the lightest bridge will be awarded 50 points, and the team with the heaviest bridge will be assigned 30 points. Teams with bridge weights between these two values will be assigned scores based on a linear interpolation between 50 and 30 points. Scores for the technical paper will be based on the organization, completeness, accuracy and adherence to the requirements given above. The Introduction section has a maximum value of 5 points, the Material Documentation section has a maximum value of 5 points, the Design Methodology and Construction section has a maximum value of 25 points, and the Figures section has a maximum value of 15 points. The team with the highest overall score wins the contest.
Location and Directions

Student Union, Bldg. 31 (CR), Rm. 174 - House Chambers
777 Glades Rd, Boca Raton, FL 33431

- From I-95
- Take Exit 45 east onto Glades Road
- In 1.8 miles Left onto W. University Drive
- Follow Curve of Road to the Left
- Turn Right into First Parking Lot
- Student Union Building North of Parking Lot
University: 

Balsa Wood Bridge
Scoring Summary Sheet

Bridge Weight

Bridge Weight Sub-Total Score (50 points maximum)

Technical Paper

1. Introduction (5 points maximum) 

2. Material Documentation (5 points maximum) 

3. Design Methodology and Construction (25 points maximum) 

4. Figures (15 points maximum) 

Technical Paper Sub-Total Score (50 points maximum)

Overall Score