

2016- 2017 USF-SE
BALSA BRIDGE
COMPETITION
RULES & GUIDELINES



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ABOUT THE USF-SE Balsa Bridge Competition

Since 2010, the Tampa Hillsborough Expressway Authority (THEA) is partnering with the USF College of Engineering to sponsor the 24th Annual Balsa Wood Bridge-Building Competition. This free fun-filled event is open to the public and promotes Science, Technology, Engineering, and Math (S.T.E.M.) education to middle school and high school students and provides students an opportunity to meet local engineers and engineering student organizations at USF. The Engineering Expo also features hands-on exhibits and shows that aim to encourage more students to pursue fields in science and mathematics. At the Balsa Wood Bridge-Building Competition, middle and high school students from Hillsborough, Pinellas, and neighboring Counties, showcase their engineering skills as their wood bridge creations are tested to find out which bridge can withstand the most weight and pressure. The student-run competition began in the 1980's, with the goal of connecting underrepresented middle and high school students to careers in engineering fields. It also provided a fun, extra-curricular educational enrichment opportunity to promote the S.T.E.M. philosophies. The competition's theme of Design It, Build It, Break It! allows teams of three students to design and build model bridges from Balsa wood and then test their load capacities. Teachers and their student teams are encouraged to watch an instructional video on the Workshop webpage which provides an opportunity to prepare for the competition and develop lesson plans that incorporate engineering and design with math and science through bridge building process.

Through its partnership with USF, THEA seeks to support community events that provide mentorship, encourage the STEM mindset, and raise the educational opportunities for Tampa Bay area students. The Wood Bridge-Building Competition is a branch of THEA's Selmon S.T.E.M. Scholarship (S3) Program. Lee Roy Selmon, a member of NFL Hall of Fame, and former Athletic Director at USF and the Expressway's namesake and THEA partnered to create the S3 Program, which provides opportunities and exposure to students about careers in Science, Technology, Engineering, and Mathematics. The program features outreach to Bay area high schools, the USF College of Engineering's Wood Bridge-Building Competition, monetary scholarships, and paid internships at the THEA.

[Source: THEA]

BENEFITS TO THE COMPETITION

BUILDING TEAMWORK SKILLS

Engineers usually work in teams, but most classroom assignments are structured as individual activities. Essential teamwork skills do not always come naturally, but they can be cultivated. Bridge building affords a rare opportunity to learn and practice the engineering team approach to problem solving. Students that work in teams, as engineers do, usually produce better results.

AWARDS AND RECOGNITION



Selmon S.T.E.M. Scholarship Program (S3)

This fund supports engineering students on the Tampa campus who are graduates of Hillsborough, Pinellas or Pasco County high schools. These scholarships are based on merit and financial need. Strong consideration is given to students who demonstrate, through leadership or volunteer activities, the challenge of a diverse and changing society. The scholarship seeks to increase the educational opportunities and exposure to transportation careers for students.

There are opportunities through the S3 Program in four categories for disadvantaged students pursuing engineering degrees:

- Freshman Book Scholarship
\$1,500 Book Scholarship (\$750 per Semester)
- Sophomore Book Scholarship
\$1,500 Book Scholarship (\$750 per Semester)
- Junior Internship w/ Book Scholarship
\$1,500 Book Scholarship (\$750 per Semester)
Two (2) Semester Internship with THEA (20 hours per week)
- Senior Internship w/ Book Scholarship
\$1,500 Book Scholarship (\$750 per Semester)
Two (2) Semester Internship with THEA (40 hours per week)

[Source: THEA]

Past Top Two Finishers

(* Efficiency Winner)

Middle School

2016

- 1) Terrace Community Middle - Bifost*
- 2) Cambridge Middle - Team #2

2015

- 1) Gulf Coast Academy - CGA1
- 2) Randall Middle - Rage Quit

2014

- 1) Terrace Middle - MME*
- 2) Randall Middle - Archy Jr.

2013

- 1) Stewart Middle - Venta
- 2) Rampello Middle - Rampello Pirate

2012

- 1) Williams Magnet Middle - RoboKouqars
- 2) Steward Magnet Middle - The Awesomeness*

High School

2016

- 1) Lennard High - Lennard 2
- 2) Lennard High - Lady Longhorns*

2015

- 1) Gaither High - Close Enough*
- 2) Lennard High - Lady Longhorns

2014

- 1) Gibbs High - 404 (Bridge not Found)*
- 2) Lennard High - SVETY

2013

- 1) Leonard High - Human Beings*
- 2) Gibbs High - 404 Bridge Not Found

2012

- 1) Gaither High - Aggravation and Modification
- 2) Gibbs High - Diana Pepper

Section 1 - GENERAL INFORMATION

General information on the competition as well as registration information for the Balsa Bridge Competition is located on the Balsa Bridge Competition website (usfbalsabridge.weebly.com). Questions regarding Competition qualifying procedures, etc. should be directed to the Balsa Bridge Competition Website's Contact Us page.

Section 2 - RULE CHANGES AND PRECEDENCE

The Rules and Regulations of the Balsa Bridge Competition are updated each year. **Teams are encouraged to read this entire document carefully and disregard rules and website postings from previous years.**

Teams should not consider items such as, but not limited to, rulings and interpretations made by judges in previous competitions as setting precedence for this year's competition.

Section 3 - REGISTRATION

Schools may register up to a maximum of four (4) teams. Each team may consist of a minimum of three (3) members and a maximum of four (4) members. Registered participants are the only persons eligible to present and load the team's Bridge. Changes of registered participants will be allowed up until 14 days before the competition.

3.1 Eligibility Requirements

Registered participants at the Balsa Bridge Competition shall meet all of the following requirements:

- 1) Be a current active student in middle or high school
- 2) Have contributed to the design and construction of the presented Bridge during the current academic year.

Section 4 - BRIDGE REQUIREMENT

4.1 Materials

Basic materials will be provided to teams that register at least fourteen (14) days prior to Competition and will have to be picked up in at least seven (7) days prior to competition. Any additional material will be the responsibilities of the teams and their associated school.

Materials will NOT be delivered to the teams or schools, instead will have to be picked up at the Engineering section of the University of South Florida Tampa Campus. More information on location and dates can be found on the Balsa Bridge Competition website.

Basic Pack will consist of:

- 1) Twenty (20) .25" x .25" x 3' Balsa wood,
- 2) Six (6) .25" x .125" x 3' Balsa wood,
- 3) Ten (10) .25" x .0625" x 3' Balsa wood and
- 4) One (1) .25-ounce Zap-a Gap glue.

Material(s) achieved will have to follow the following specification

- 1) Balsa wood:
 - Max cross-section size is ¼" x ¼"
 - Must be made of the material of balsa wood

- 2) Glue
 - Any liquid glue

4.2 Display Requirements

Bridge display and tested at competitions shall adhere to the following requirement. Any that fail to follow will be immediately disqualified and will not be tested in the competition.

Requirements are as follows:

- 1) The Bridge must be "free standing."
- 2) Total mass of the Bridge, including glue, may not exceed 110 grams.
- 3) Maximum dimensions of the Bridge shall not exceed 500 mm in length, 100 mm in width and 300 mm in height.
- 4) The Bridge feet must be at a minimum 400 mm apart from each other measuring from the inside and must raise the Bridge a minimum of 20 mm.
- 5) The minimum height of the "roadway surface" is 100 mm above the bottom of the Bridge feet.
- 6) The Bridge must provide a "roadway surface" that is approximately level. The roadway surface must have a minimum width of 46 mm. The roadway surface must extend the entire length of the completed Bridge.
- 7) No fastening method other than mechanical interlock of the balsa pieces or commercial glue is allowed.
- 8) The Bridge design must allow the standard testing block to be placed on the roadway surface with the testing rod(s) extending beyond the sides of the Bridge. (See Bridge Testing)
Alternatively, a 3/4 inch hole may be provided for a metal rod to extend up through the deck for the testing block to be affixed.
- 9) The Bridge may not be painted or coated in any way including coating of members with glue.
- 10) In order to prevent damage to the Bridge during transportation to the contest, during handling and during the contest, each Bridge should be in a protective container such as a cardboard box. The Bridge should be fabricated of high enough craftsmanship to withstand normal handling by the judges. The contest supervisors are not responsible for any damage to Bridges.

Section 5 - BRIDGE TESTING

The load capacity test will be conducted with a Pitsco Structure Testing Instrument as follows:

5.1 The Bridge will be placed on the testing stand consisting of two (2) flat, level surfaces which will be level with respect to each other and separated by approximately 350 mm.

Option I: A 17 x 4 cm testing block will be placed on the roadway surface at the center of the span with 12.5 mm diameter rod extending up through the Bridge. The load shall be applied to the Bridge using the rod placed in a hole in the test block symmetrical about the center of the span.

Option II: A 17 x 4 cm testing block will be placed on the roadway surface at the center of the span with a 12.5 mm diameter rod extending beyond the sides of the Bridge. The load shall be applied to the Bridge from two (2) rods placed in slots in the test block symmetrical about the center of the span.

Whether Option I or II is used will be determined by the design of the Bridge. If either option works, Option I, one (1) rod, will be used.

5.2 A testing device will slowly apply pressure downward until one of the following occurs:

5.3 Catastrophic destruction takes place when:

- 1) The vertical force applied drops to zero (0).
- 2) The downward deflection of the Bridge exceeds 35 mm. The load that the Bridge sustained when the deflection reached 35 mm will be considered to be the failure load.

Section 6 - DRAWING GUIDELINES

Along with the Bridge, a scaled drawing will need to accompany the submitted Bridge. The drawing needs to have the below information. Not having all the information will NOT disqualify the team. However, it WILL cause a deduction from the amount of achievable points during scoring.

6.1 A scale needs to be present on Drawing. Scales are written a:b, where 'a' is the size on the Drawing in comparison to the size 'b' of the actual object. e.g. 1:2 inch scale means on inch on the Drawing is two (2) inches on the Bridge.

6.2 The following information need to be placed on the lower right hand side of the Drawing

Team Name		
School Name		Teacher(s) name
Team Member Names		
Scale	Date	Grade Levels
Scoring		

6.3 Size dimensions need to be labeled on Drawing.

At minimum height, length and width needs to be present.

6.4 Top, front, and side views need to be present.

6.5 Text and numbers can be handwritten or typed, but MUST be readable and legible.

6.6 Non-graphing paper is preferred, but not required.

6.7 Example Drawing:

The example drawing shows three views of a bridge: TOP VIEW, SIDE VIEW, and END VIEW. Dimensions are provided for each view:

- TOP VIEW:** Length is 500 mm MAX. Width is 46 mm MIN to 100 mm MAX.
- SIDE VIEW:** Height of the roadway surface is 300 mm MAX. A note states "ROADWAY SURFACE MUST BE AT LEAST THIS HIGH". The bridge deck width is 400 mm MIN. The bottom support height is 20 mm MIN.
- END VIEW:** Total height is 100 mm MAX. The roadway surface height is 46 mm MIN. The bottom support height is 100 mm MIN.

Notes:

- The Roadway surface must extend the entire length of the bridge
- The total mass of the bridge may not exceed 110 grams.

Table for Team Information:

TEAM NAME		
SCHOOL NAME		TEACHER NAME
TEAM MEMBER NAMES		
SCALE	DATE	GRADE LEVEL
SCORING		

Section 7 - JUDGING

- 7.1 Bridges will be visually inspected, measured and weighed for compliance to the rules. Bridges failing to pass these requirements will not be scored in the competition. The failed Bridges may be load tested at the discretion of the judges, if the team requests the test.
- 7.2 Bridge design drawings will be examined and compared with the completed Bridge.
- 7.3 Points will be given for craftsmanship, originality and design drawings.

Section 8 - SCORING

- 8.1 The Bridge contest will be scored on the following four areas of achievement:
- Load capacity** - The Bridge will be loaded to determine how much weight it can support.
 - Design Drawings** - Score will depend on:
 - Resemblance** - The accuracy of the drawings in relationship to the Bridge. The drawings may be full size or to scale.
 - Dimensioning** - Proper indication of the height, width and length of various parts of the Bridge.
 - Completeness of Title Block** - Must indicate: Team's name, School name, Teacher(s) name, team members' names, scaling, grade level(s), and date of completion.
 - Appearance and Neatness** - Quality and cleanliness of the representation.
 - Craftsmanship** - The workmanship and care taken in constructing the Bridge.
 - Originality** - Imaginative or innovative concepts used in design and construction of the Bridge.
- 8.2 **Point Distribution**
- Points are used in determining the scores of the Bridge and their teams. Points are distributed as follows:
- Load Capacity**

1) 1st Highest	70 Points
2) 2nd Highest	60 Points
3) 3rd Highest	50 Points
4) 4th and Below	30 Points
 - Design Drawings**

1) Points range from	0 to 10 Points
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 - Craftsmanship**

1) Points range from	0 to 10 Points
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 - Originality**

1) Points range from	0 to 10 Points
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- 8.3 **Placings**
- First and Second place winners are determined by the two teams with the most points. There will be the two (2) winners as well as an efficiency winner, team with the largest amount of efficiency (See Ties for calculation), for each school group (Middle and High School).

Section 9 - TIES

9.1 If there is more than one Bridge which attains the same load capacity at failure, the position of an entry will be decided by comparing the efficiency of the Bridges.

9.2 The efficiency of each Bridge will be determined by dividing the load at failure by the weight of the Bridge.

$$\text{Efficiency} = \frac{\text{Failure load}}{\text{Weight of Bridge}} \times 100$$