ABC UTC ACCELERATED BRIDGE CONSTRUCTION UNIVERSITY TRANSPORTATION CENTER

Activity: Balsa Wood Bridge (ABC-style) – Rules

The mission of this competition is to provide creative problem solving opportunities for the participants by incorporating concepts of mechanics, construction (ABC), materials durability, and project planning all in a series of events. By working in teams, participants will also learn teamwork, the appreciation and understanding of others, and that a group is a more powerful thinking force than an individual.

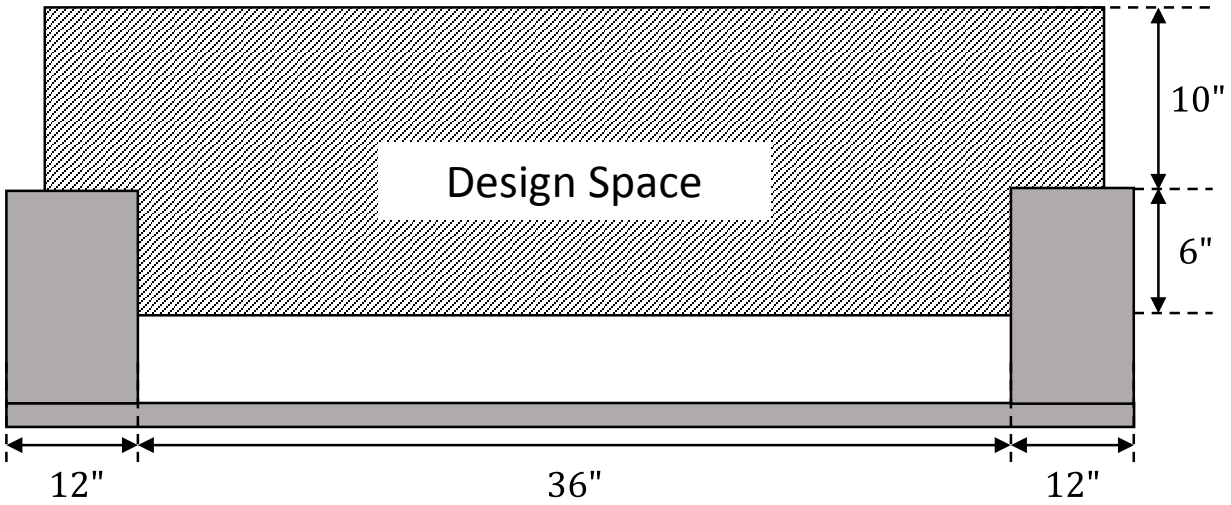
For this competition each group must construct a balsa wood bridge with multiple components that need to be erected prior to loading. They also have to present a skit about a story of their bridge, its construction, and uses.

Provided Materials:

1. 1/16” Balsa Wood (square rods, 1/16” x 3” sheets, and 1/16” x 6” sheets)
2. Glue (hot glue and wood glue)
3. Cutter (scissors and saw)

Competition Rule:

1. Teams are responsible for constructing the superstructure for their bridge. The foundation for the bridge shall be provided at the testing site.
2. The bridge must be positioned in the below design space with a six inch wide space envelope.



3. The bridge must have 6” of clearance from the base.
4. Only the materials provided above may be used in the competition.
5. 1/16” rods may be bundled in maximum bundles of 3 and only connected at their ends.
6. 3” wide sheets can only be used for gusset plates (i.e. points where different rods intersect)
7. 6” wide sheet can only be used for the roadway. This roadway can be attached to truss sections, but no additional rods can be glued to directly to the 6” sheet.
8. The bridge must be constructed into three separate parts maximum length of 18 inch.
9. Gusset plates can be used as connector.

10. Bridge pieces will need to be transportable to the job site (in the provided box) for final assembly and must be connected by truss members not by bridge deck. Each team will have **10 minutes** to complete the final assembly of their bridge.
11. Bridge may be fixed on one support only using small clamps.
12. The bridge must be able to hold a moving car load of 0.5 lbs.

Competition Outline

Step 1: Bridge design and material request (1 to 3 hours)

Bridge Design: Teams use Bridge Design Software to design their bridge and then should sketch their bridge (possibly to scale on a piece of poster board) to determine the materials required. To scale drawing can also be used as a guide for constructing the bridge.

Material Request: Each team must determine from their designs the amount of material they will need. The teams may request this material throughout the camp. The final cost of the bridge will be determined from the material requested and factored into the scoring.

Step 2: Initial construction of bridge sections (1 to 3 hours)

Initial Construction: Each team must transport the bridge components to the construction site (in the provided box). Each team will then have a 30 minute construction window to complete the connection of their bridge.

Step 3: Accelerated construction of full bridge (10 minutes)

Accelerated Construction: Each team will have 10 minutes to put together each piece of their bridge.

Step 4: Initial load testing (15 minutes to practice and execute loading)

Initial Loading: Each team will need to drive a load of 0.5 lbs. across their bridge. Each team may have three practice runs on their bridge without extra weight (to practice driving the RC car). Each team will have only three tries to drive the load across their bridge. The bridge must sustain the load and the car must cross the bridge for the passing of this round.

Step 5: Skit and presentation on bridge (10 minute time limit)

Skit: A different skit will be developed by each team. The skit will be used to tell the story of the bridge: why it is being built, why there is a limited construction window, why the structural shape was chosen by the designers and how it fits into the community, what are the challenges for the bridges location (i.e. natural disasters expected)

Step 6: Natural disaster and emergency repair (OPTIONAL, 30 minutes)

Natural Disaster: Each team will roll a die to determine the natural disaster their bridge will undergo. The natural disasters will be:

- 1 or 2 = flooding
- 3 or 4 = support settlement/earthquake loading

- 5 or 6 = hurricane/wind loading

After the natural disaster, the students have 15 minutes to conduct emergency repairs to the structure.

Step 7: Final loading.

Final Loading: The final bridge will then be loaded to failure (or 10 lbs.) starting at the 0.5 lb. loading. Each team has to drive the car across the bridge for each load increment.

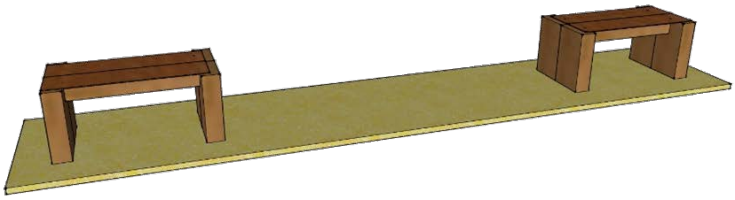
Bonus factors:

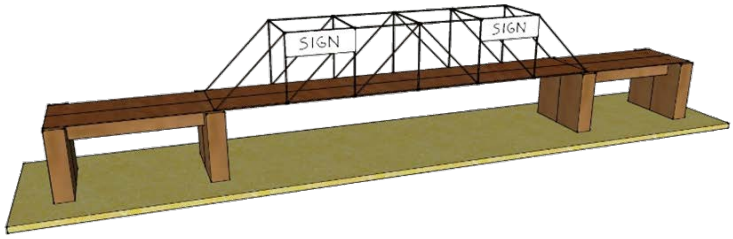
1. Creativity, organization and quality in skit.
2. Extra loading over the car weight to the bridge.

Winner will be decided by highest point considering:

1. Presentation and creativity of skit.
2. Least expensive bridge able to carry necessary load.
3. Ability of bridge to withstand the natural disaster.
4. Extra load over the moving car.

Layout of space and Sample Bridge:





Things to Consider for Skit Development

1. How did you decide on the structural shape?
   a. Was the shape decided on to optimize material?
   b. Did the local community have an influence on the chosen shape?
   c. Is it just a shape that you always wanted to design?
   d. Other reasons??
2. Why was ABC required?
   a. Limited construction space
   b. Limited construction time
   c. Bridge durability
   d. Emergency bridge replacement
   e. Other??
3. Why is the natural disaster happening?
   a. Is bridge located in a coastal region?
   b. Is bridge in area with difficult soils?
   c. Other reasons??
4. What is the reason for the loading?
   a. Is it on a heavily traveled truck route? If so, why so many trucks?
   b. Does it connect major cities?
   c. Is it a bottle-neck (only bridge in the area) across a body of water?
   d. Other reasons??
5. What were the difficulties during construction?
   a. Only material source was a delicate building material?
   b. Other difficulties??