CASE WESTERN RESERVE UNIVERSITY
THE DEPARTMENT OF CIVIL ENGINEERING
ANNOUNCES
A MODEL BRIDGE BUILDING CONTEST

RULES

1) **Materials** - Balsa wood and carpenter's glue are the only two materials which may be used to build the model. No other materials or coatings are permitted.

2) **Bridge System**
   a) The model must be able to span between two supports placed 24" apart. The supports provide only (upward) vertical forces. The model length should be between 24 1/2" and 26".
   
   ![Diagram](image1)

   b) The height of the model must be ≤ 8". The weight of the model must be ≤ 5N.

   c) The width of the model must be ≤ 12".

   d) The model must have a horizontal deck along its entire length. There must be a minimum 4" x 5" open area above the deck along its entire length.

   ![Diagram](image2)

   e) The model will be tested by applying a downward force on the horizontal deck over a 2" x 4" area. The load will be applied at one of three possible positions:

   i) ![Diagram](image3)
   
   ii) ![Diagram](image4)

   iii) ![Diagram](image5)

   The load position will be determined on the day of the contest. All entries will be loaded at the same position.
3) The following quantities will be measured:

i) The vertical deflection of the bridge at the loading position.

ii) The applied force

The test will be stopped when the applied force reaches a maximum and then begins to decrease, the maximum load exceeds 500 lb, or when the deflection reaches a value of 2”.

4) Assessment

Two quantities will be used to evaluate bridges:

a) Structural Performance: (maximum applied force)/(model weight)

b) Innovativeness-aesthetics of design

5) Awards

All student participants will receive a commemorative T-shirt. Teams are limited to three or fewer members.

Overall: A $50.00 prize will be awarded for the entry with the highest overall score based on the structural performance and innovativeness-aesthetics. Each criteria will be equally weighted to determine the overall score.

Structural Performance: A $50.00 prize will be awarded for the entry with the largest:

(maximum applied force)/(model weight)

Innovativeness – Aesthetics: A $50.00 prize will be awarded for the entry which is judged to be most innovative and has the best appearance.

6) An entry must meet all the rules in order to be eligible. All entries will be judged for eligibility. Judges’ decisions are final.

For additional information, contact the Civil Engineering Department at (216) 368-2778.

HINTS/SUGGESTIONS

1) Some readable reference texts are:


b) Salvadori, M. and Heller, "Structure in Architecture".

2) A solid rectangular block of wood will not be the most efficient solution (and is not in the spirit of the contest).

3) Failure can occur from "lateral instability" if the model is tall and narrow.

4) The area over which the force is applied can "punch through" the deck. So strengthen the deck under the loading area.

5) Connections are usually the weakest links. Use “lap” connections or “gusset plates”, avoid “butt” connections.

6) Some possible systems which you can consider:
   a) A "box beam"

   b) A "tied" or "bowstring" arch
c) An inverted "tied" or "bowstring" arch

Vertical arches
Inclined arches

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d) A "deck" truss (a triangulated network of pieces)

Vertical sides
Inclined sides

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e) A "through" truss

Vertical sides
Inclined sides

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f) A "king post" "through" truss

Vertical sides
Inclined sides

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g) An inverted "king post" truss

Vertical sides
Inclined sides

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h) A "girder" or beam bridge

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