

Battle of the Bridges
Saturday, January 26th, 2008

- Objective:** To build a model bridge onsite given a box of materials provided at the workshop within a time limit of 3 hours that is capable of supporting the greatest load per unit of mass.
- Location:** Putnam Museum & IMAX Theatre
1717 West 12th Street
Davenport, IA 52804
General Information: (563) 324-1933
www.putnam.org
- Category:** The contest is open to any student, grade or age. A team may consist of one, two, three or four people. Teams will be categorized accordingly. All members of the team must be signed up on the registration form. Registration is limited to the first 60 participants.
- Dare Devils (Grades 1-3)
 - Elementary (Grades 4-6)
 - Middle School (Grades 7-8)
 - High School (Grades 9-12)
 - College
 - Family (Any combination – kids, adults, seniors)
- Cost:** \$5.00 per team. The cost includes a bridge kit provided to you at the workshop, snacks and a Certificate of Participation.
- Schedule:** Registration Deadline – Wednesday, January 23rd, 2008. Registration forms can be obtained from our website. If you have any questions, please contact the Putnam Museum at (563) 324-1054.
- Contest Date – Noon to 5 pm, Saturday, January 26th, 2008. Judging by category begins at 3 pm
- Prizes:** Bridges with the highest structural efficiency ($E = \text{maximum load} / \text{model mass}$) will be awarded prizes in each category for first place. All participants will receive a Certificate of Participation when they load test their bridge. Snacks will be provided to all participants!
- Sponsors:** Lead Sponsors – Riverboat Development Authority & Quad City Times
- Supporting Sponsors – Shive Hattery; KBR; ALCOA; Putnam Museum and IMAX Theatre; Vickie Anne Palmer Foundation
- Promotional Sponsors – Mindfire Communications; DMW Design; Silver Oaks; LAMAR; WQAD; QC Engineer & Science Council
- Bridge Building Guidelines:** Prior to the Battle of the Bridges contest, we encourage you to explore on the internet other bridge contest, bridge building tips or at the very least consider some of the guidelines provided below. This will help you generate ideas prior to contest day.
1. Some excellent websites to begin generating ideas, learn more about bridges, bridge building and other bridge contest are listed below:
 - a. <http://www.bridgesite.com/funand.htm>

- b. <http://bridgecontest.usma.edu/>
2. For additional bridge ideas look around at real bridges. Remember that for a real bridge, the important part is not the deck that the cars drive on, but the steel or concrete structure that supports the deck.
3. Your bridge needs to have a solid, stiff shape in all 3 dimensions. Engineers call this “maximizing the moment of inertia” of your structure. For example, take a Popsicle stick on its flat side and have it overhang from the edge of a table. Then, apply a bit of force with your fingers at the loose end and notice the deflection of the stick. Now, try the same thing; but, this time place the stick on its edge and try to bend the stick now. Notice how the stick is much stiffer and stronger when on its edge?
4. A bunch of sticks glued together flat, like a raft, has very little strength and will sag during testing under very little load.
5. The strongest structural shape is the triangle. A bridge which is made of a series of triangles will be very strong.
6. A bridge that is symmetrical is less likely to twist when loaded and hence will probably carry more load.
7. Bridges which are built too tall will have a high moment of inertia (which increases stiffness and strength – a good thing); however, they may become unstable under a load (a bad thing). This may cause your bridge to twist or topple to one side and...well, you can guess.

Bridge Contest Rules, Testing and Evaluation:

1. Teams will build bridges onsite given a box of materials provided at the workshop within a time limit of 3 hours that is capable of supporting the greatest load per unit of mass.
2. Bridge models will be loaded at the middle of the span. Care should be taken in the design to reinforce this area as well as the end supports with bracing. The load, supplied by the judges, shall hang from the bridge. The load will be applied downward, from below, by means of a square plate resting on the loading plane of the bridge. The two edges of the loading plate will be parallel to the longitudinal axis of the bridge at the time of load application. The plate will have an eyebolt attached from below at its center. Masses will be supported on a vertical loading rod suspended from the eyebolt. Bridges must be designed to accommodate the loading apparatus.
3. The weight of the model will be recorded prior to testing.
4. The load shall be increased until the bridge fails. The largest achieved load will be recorded.
5. The model will be judged based on the highest efficiency rating ($E = \text{maximum load} / \text{model mass}$).
6. Testing will consist of the application of an increasing load until the bridge breaks. The peak load recorded up to this point will be considered the breaking load.
7. Bridge length: maximum 26 inches; minimum 20 inches. Bridge must span a gap of 20 inches.
8. Bridge height: maximum none; minimum 3 inches.
9. Bridge width: maximum 6 inches; minimum 4 inches. Must have floor system across the whole bridge except the overhangs.
10. Bridge overhangs: maximum 2 inches; minimum $\frac{1}{2}$ inch. Bridge overhang is independent of Bridge length.
11. Bridge structure may project up to 2 inches below the top of the supports.
12. In the event of a tie or multiple bridges with the same efficiency rating, the lightest bridge wins. It is up to your team to decide on the optimum balance between mass and strength.
13. All construction and material requirements will be checked prior to testing by the judges. Bridges not meeting specifications will still be tested but will not be eligible for prizes.
14. Judges will be provided by the contest sponsors. All decisions of the judges are final.
15. The rules will be finalized no later than January 23rd, 2008 for this competition.

Be creative and have fun!!! We look forward to seeing you and your amazing bridges.