



Maryland Engineering Challenges™
2011
Straw Bridge Guide

Supported By:

American Society of Mechanical Engineers—Baltimore Section

Level:

Middle School—Grades 6 to 8

Important Dates:

Coaches' Information Session:

Thursday, November 11, 2010
4:00 – 7:00 p.m.

Hands-On Workshop:

Saturday, January 29, 2011
10:00 a.m. – 2:00 p.m.

Registration required, information available at November session

Registration Deadline and Written Report Due:

Friday, April 15, 2011
4:00 p.m.

Competition Date:

Saturday, April 30, 2011
9:00 a.m. – 3:00 p.m.

Important Information:

All Straw Bridge activities will be held at:
Baltimore Museum of Industry, 1415 Key Highway, Baltimore, MD 21230

For information about engineering requirements, contact Paul Borthwick at rpborthw@yahoo.com and Roberto Montanez at roberto.montanez@gmail.com

For registration information or general questions about the Maryland Engineering Challenges, contact Melinda Cané at mcane@thebmi.org. Detailed information about the competition event will be sent to Coaches after the registration deadline.

To register a team, adult Coaches should go to <http://tp1.clearlearning.com/hshealey/EC.tp4>. Please note there is a \$5 PER COACH registration fee. Only one Coach is needed per team, although a team may have as many adult helpers as needed.

Written reports must be submitted AS HARD COPIES, either by mail or in person, to:
BMI, 1415 Key Highway, Baltimore MD 21230



The Challenge:

Design and construct a model road bridge made exclusively from soda straws, hotmelt glue, and plastic tabs. The roadbed of the bridge must be at least 6 but no more than 7 inches wide. Additionally, the bridge must provide a vertical clearance of at least 3.5 inches. The bridge must span a 20-inch wide hazard with the only support being the 0.5 and 1 inch ledges available at 0.75 and 4.75 inches down from the level of the roadbed, as well as the vertical wall above the uppermost ledge and between the ledges. The total depth of the hazard is 9 inches. The bridge should be as light as possible while being able to support a load, represented as a model truck, weighing 6.5 pounds for one minute.

Team Requirements:

Recommended team size is 2 to 4 students.

Performance Guidelines:

- Prior to load testing the bridge will be weighed, to within 1/10 of an ounce, on a postal scale.
- The bridge will be placed in the hazard and a challenge-provided cardboard “roadway” installed.
- The bridge will be load tested using an “Eighteen Wheeler” model truck that has been weighted to approximately 6.5 pounds.
 - The truck will be towed onto the bridge by means of a string attached to the tractor.
 - The truck must, unassisted, remain upright during the towing process.
 - When the truck is stopped in the middle of the bridge the timer will be started.
 - The truck will be left on the bridge for a period of one minute.
- All bridges successfully completing the one minute load test will receive a performance score based on overall weight, with the lightest bridge receiving the maximum 35 points.

Design & Construction Standards:

- The bridge must conform to the specifications in this paper; however, credit and awards are also given for ingenuity and creativity.
- The bridge must hold a 6 inch wide cardboard “roadway” made from light cardboard. Challengers should not assume any strength will be provided to the bridge structure by the cardboard roadway. While instructors are encouraged to build their own hazards and roadbeds for testing, on the day of the competition the judges will provide the hazard and roadway. The roadway must not be attached to the bridge in any way.
- The bridge may have any height above the roadway and any descent below the roadway, provided the bridge structure does not touch down between the designated support points within the hazard.
- A detailed “Straw Bridge Design Guide,” giving further information and tips, should be downloaded from www.thebmi.org. This will be available by November 11, 2010.
- Allowed materials:
 - Drinking Straws: Sweetheart “JUMBO” straws, 7-1/4 or 10 inches long by 15/64 inches diameter (available from challenge sponsors)
 - Hotmelt Glue (low temp recommended)
 - Plastic tabs, at the joints only (typically from plastic soda bottle or milk jug)

Evaluation Standards:

All Middle School competitions involve four main components: a written report, an oral report, evaluation of the design and construction of the entry, and the entry’s performance under competition conditions. An outline of what is required for each of these, and guidance on preparing for the competition, is given in the “Middle School Guide to Entry”, which should be read in connection with this document.

The challenge scoring consists of four parts:

1. WRITTEN REPORT AND DRAWINGS

30 Points

The preferred format of the report is typewritten using a standard word processor program, although points are not deducted for a hand written report. An introduction to preparing a professional report, the "Straw Bridge Written Report Guide" may be downloaded from www.thebmi.org for further information

2. ORAL PRESENTATION

10 Points

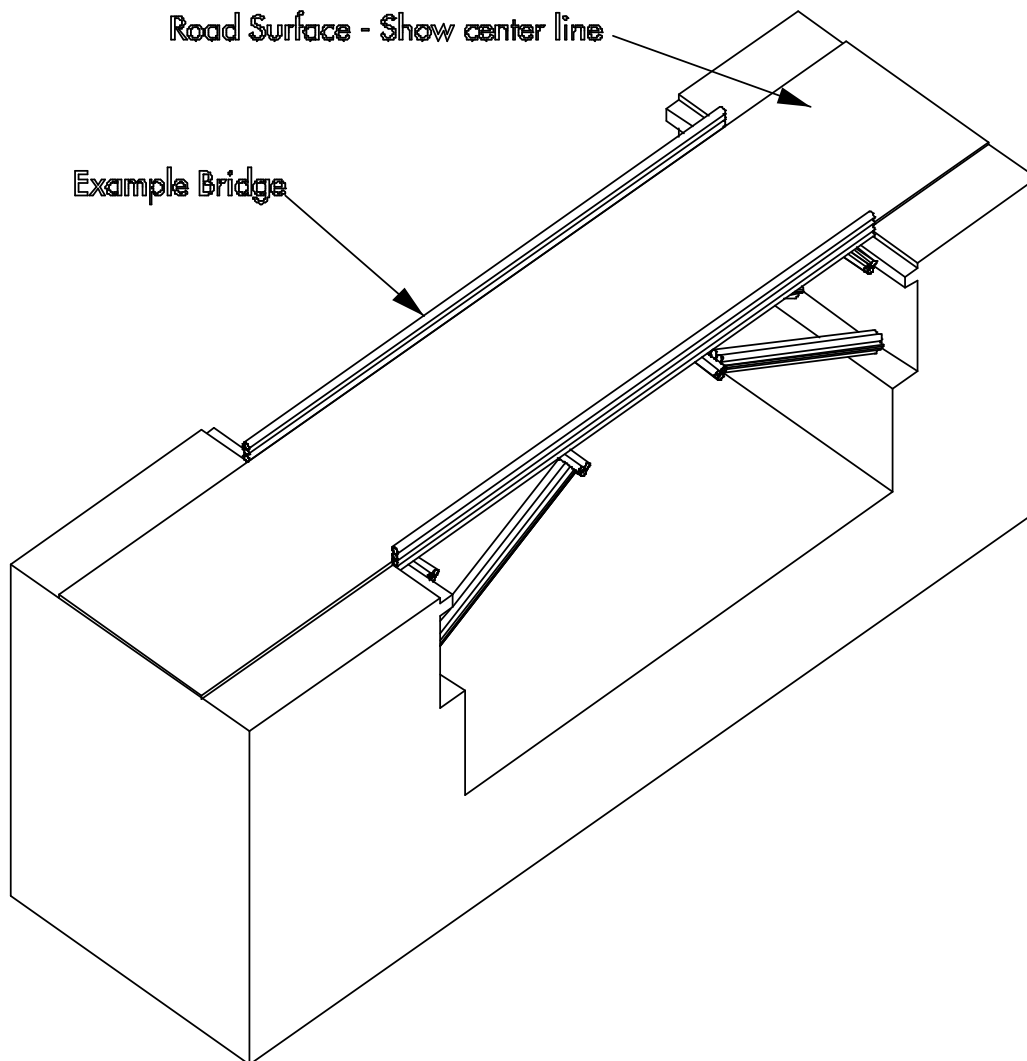
3. DESIGN AND FABRICATION

25 Points

4. PERFORMANCE DEMONSTRATION

35 Points

Reference Drawings:



Orthogonal Sketch of Simple Bridge
Shown Over Hazard
Road bed must be at least 6" wide

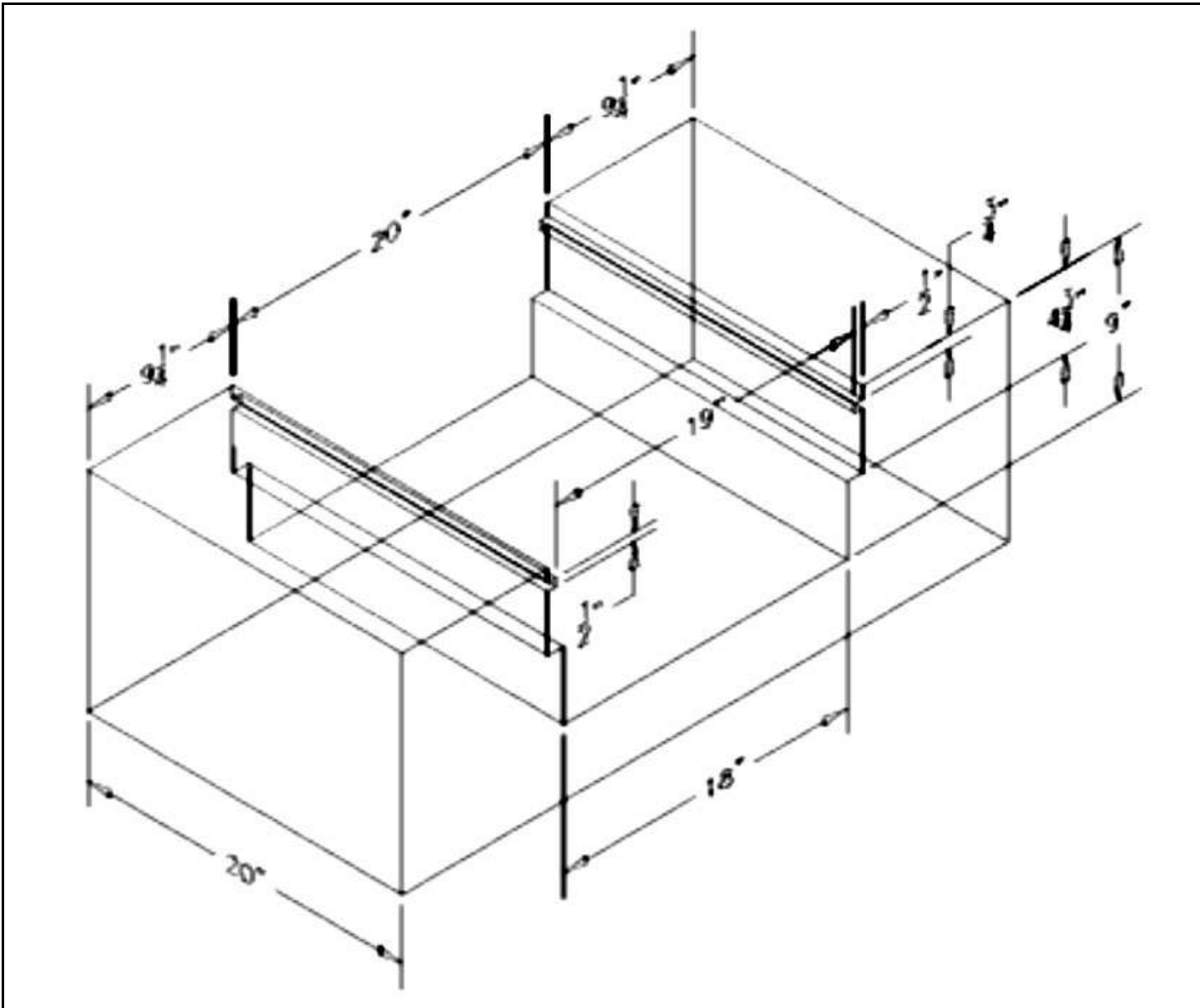


Figure 1. Line Drawing showing the pertinent dimensions of the straw bridge hazard. (prepared by Jesse Cromer, Teledyne Energy Systems, Inc.)

GOOD LUCK TO YOUR TEAM!