

Name(s): _____ Date: _____ Hour: _____

Bridge Building Project

Objective:

Design and engineer a bridge using $\frac{1}{8}$ inch by $\frac{1}{8}$ inch balsa wood to hold as much mass as possible over a 12 inch span. Your group will be allotted 12 - 3 foot long balsa pieces.

Goal:

Build a bridge that can support the most mass while being the lightest possible bridge and still meeting the requirements. This produces the maximum efficiency of the bridge.

Requirements:

- The overall width of the bridge must not exceed 4 inches.
- The overall length of the bridge must not exceed 15 inches.
- The bridge must be long enough to span a 12-inch gap.
- The bridge must be made entirely out of balsa wood.
- The bridge shall have no structures below the abutments that support the bridge.
- Wood glue can only be used at the bridge joints. No coating the balsa wood!
- The mass of the bridge may not exceed 40 grams.

Testing:

- We will determine the mass of the bridge before testing it.
- All bridges will be put through the same testing procedure.
- Mr. Pepper will attach the testing bucket to the bridge prior to each test.
- Once ready, you will be able to add weight to the bucket at the rate that you wish, however there will be a 5 minute maximum allowed testing time.
- You must keep adding weight to the bucket until the bridge collapses.
- We will determine the total mass that it took to destroy the bridge once the test is complete.
- If a bridge doesn't break and all of the masses are used, the lightest bridge is the one with the best efficiency.

Problem (5pts):

In the space below, identify the problem. What are you trying to achieve? How will you meet your goal? What will you need (materials) to achieve your goal?

Research (10pts):

Check out the following websites for ideas on various bridge styles and building information.

<http://pghbridges.com/basics.htm>

<http://www.pbs.org/wgbh/buildingbig/bridge/basics.html?4>

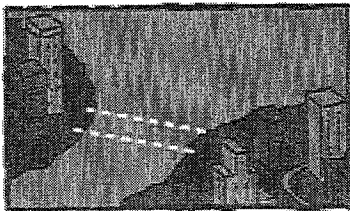
<http://science.howstuffworks.com/engineering/civil/bridge1.htm>

<http://www.explainthatstuff.com/bridges.html>

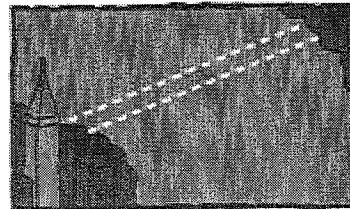
What style of bridge are you thinking of trying to build based upon your research? Why did you choose this style? What are its strengths and weaknesses?

Go to the following website and read through the information about bridge types. Solve the various problems and record the correct bridge at each location.

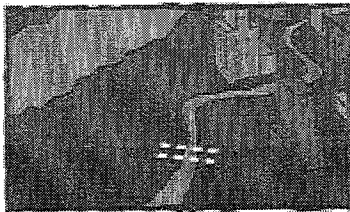
<http://www.pbs.org/wgbh/buildingbig/bridge/challenge/index.html>



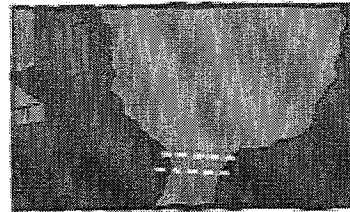
1. _____



2. _____



3. _____

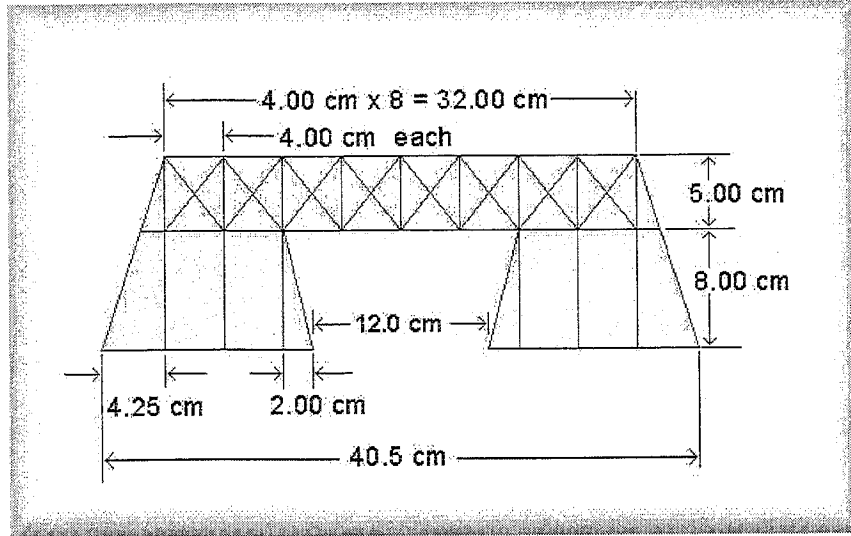


4. _____

Blueprints (20pts):

Before you can build, you have to sketch out your ideas. Blueprints help guide the building process and avoid material waste. Using graph paper, you need to sketch, label, and have dimensions listed for a side-view and a roadbed view. Use a ruler to make straight lines! An example is shown below:

Side View Example



Cost (10pts):

What is the total cost of your bridge? In the real world, materials need to be purchased and rented in construction. Time really is money! Using the table below for costs, how much have you hypothetically spent to build your bridge?

Material	Quantity	Cost	Your Total Cost For Each Item
Wax paper	1 foot	\$50	
Pins	1 pin	\$50	
Serrated Shears	1 for the hour	\$100	
Balsa wood	1 inch	\$500	
		Total Cost Of Your Bridge =	

Efficiency (10pts):

The structural efficiency tells us how strong our bridge is relative to its own mass. The higher the efficiency number, the greater the overall construction of the bridge. Practice calculating efficiency given mock values.

$$\text{Structural Efficiency} = \text{Load Supported (g)} / \text{Mass of Bridge (g)}$$

Example:

Load Supported: 1500g

Mass of the bridge: 30g

Efficiency: $1500\text{g}/30\text{g} = 50$

1. Load Supported: 2000g

Mass of the bridge: 5g

Efficiency: _____

2. Load Supported: 3000g

Mass of the bridge: 35g

Efficiency: _____

3. Load Supported: 4000g

Mass of the bridge: 20g

Efficiency: _____

4. Load Supported: 1000g

Mass of the bridge: 10g

Efficiency: _____

5. Which bridge had the greatest efficiency rating? _____

Test (20pts): Target efficiency is 2000

Mass of your bridge: _____

Load Supported: _____

Efficiency of your bridge (show your work): _____

Observations during the test (where does stress appear to be greatest on your bridge?):

What part of your bridge appeared to be the strongest?

Which part of your bridge was the weakest and led to bridge failure?

Reflect (5pts):

What were your successes in this project?

What might you do differently to your design if you could rebuild your bridge? Why?

What did you learn from this project that you didn't know before?

Participation (20pts): If one of your group members is off task, all are considered off task and losing points for the day. Stay focused!

Participation	Day 1	Day2	Day 3	Day 4	Day 5
Safety					
Clean up					
Personal Responsibility					
Collaboration					