

Popsicle Bridge Challenge

Objective: To build a bridge using nothing but Popsicles and glue following all rules of the project in 5 cycles.

Framework objectives: To understand the three major types of bridges. To understand the forces of tension, compression, torsion, bending and shearing and how they affect bridge performance. To understand the effects of load and structural shapes on bridges.

This Project will be made up of 4 sections.

1. Introduction and explanation - 1cycle

This will start with a classroom discussion, include demonstrations, question and answer session and reading of the entire project to make sure all students understand what is expected of them.

2. Research and Design - 1cycle

This will include students performing online research. Selecting a specific bridge design and drawing their design on the included graph paper.

3. Construction - 2cycles

All teams will have at least 2 cycles (4days) to build their bridge. If students don't need all the time given to them for the other sections they may use that extra time for building.

4. Testing and Final report due - 1cycle

The final section will have all completed bridges tested for strength. After testing teams will complete the required math work, and compile their final reports to be passed in no later than the final day of this project. Any team passing their report in late will have points deducted from their overall grade. For each cycle late = minus one grade.

Code of Ethics

No team shall bother another team.

No team shall leave their area messy

No team shall build a bridge that does not follow the rules.

No team/person shall be loud or boisterous.

No team/person shall wander around looking for ideas from other teams.

No team/person shall handle another teams materials, paperwork, drawings, etc or bridge.

Breaking any of these rules will result in a deduction from the overall grade. Continued disturbances will result in disciplinary action.

Introduction

What are the three main types of bridges?

What is Tension? What is Compression?

What is Torsion? What is Bending? What is Shearing?

What is Load and how does it affect different structures?

Approved websites for Research

<http://science.howstuffworks.com/bridge.htm>

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

<http://www.garrettsbridges.com/building/popsicle-stick-bridges/>

<http://www.tesd.k12.pa.us/stoga/dept/science/physics/morebridge.htm>

Drawing Rules

After completing your research you will create a drawing showing exactly the bridge you have chosen to build.

1. You shall create a drawing that shows four (4) views of the bridge.
 - a. Side view
 - b. Top view
 - c. Front view
 - d. Road Bed view
2. The drawing must be neat and accurate. Once your drawing is complete you may begin building but **YOU MAY NOT CHANGE YOUR DRAWING once you start building.**

Construction

1. Your only resources are Popsicles and glue, both provided by the teacher.
2. **You may not** use the glue to reinforce the Popsicles in any way. You may only use the glue to connect / bond / join / the Popsicles together. Keep a running total of the number of popsicle sticks used.
3. When the bridge is complete it may only touch the “dirt” and not the “water” on the testing template.
4. The bridge must be 2 inches tall measured from the water level to the lowest part of the bridge.
5. The bridge must be 3 ½ inches wide and from the road bed to the highest point be 2 inches tall. This will allow cars to drive over the bridge.
6. The bridge will be self contained. Meaning you should be able to pick up the entire bridge in one piece without having to assemble anything after moving it.

Testing

The bridge will be placed on the testing template and checked for the following rules.

Is the bridge long enough so that the legs are only on the “dirt” and do not touch the water?

Is the bridge wide and tall enough to fit a passenger vehicle (car) over/through it?

Is the bridge tall enough over the water to provide clearance?

Does the bridge match the drawings?

If the bridge passes all of the above requirements, strength testing will begin. First the bridge will be weighed and the results documented by the team that constructed the bridge. A holder will then be connected to the center of the bridge and weights will be added until the added weight causes the bridge to make contact with the testing template. (Meaning, it bent a lot or the bridge fails) What ever the last added weight was, it will be removed and the previous total will be recorded as the maximum weight. Note: The teacher will wait 15 seconds after each weight is added before adding the next weight.

Efficiency = Weight of Bridge / The amount of weight the bridge held.

Final Report

Will contain the following parts.

1. Cover letter/page.
2. Answers to the questions in the introduction section
3. Drawing showing the four views of the bridge.
4. Weight of the Bridge, How much it held, and the efficiency calculations. Show all work.
5. How many Popsicles did you use?

Rubric

	5	4	3	2	1
Team Work	All members helped out	All member(s) helped out with a few minor exceptions	Member(s) did 50 to 75% of the work	Member(s) did little to no work	Member(s) did no work at all.
Drawing	Accurate, neat, matches bridge perfectly	Neat, matches bridge but not perfect	Neat, does not match bridge at all.	Messy, not accurate, does not match bridge.	No drawing
Construction Rules	Met all rules for construction	Failed one rule	Failed two rules	Failed three rules	Bridge unacceptable
Testing Results	Held 1000g or more	Held at least 750g	Held at least 500g	Held at least 100g	Held no weight.
Math	Correct values given, all work completed and correct	All work completed but mistakes present	Values given but no work done.	Wrong Values given and no work done.	No work done, No values given
Final Report	All introduction questions answered properly with no spelling mistakes	All introduction questions answered properly with spelling mistakes	Missing introduction questions missing, remaining answered properly	Missing introduction questions missing, remaining answered improperly	No questions answered.

Code of Ethics Deductions _____

Total points earned _____

Total points possible 30

A = (30 – 27), B = (26 – 24), C = (23 – 21), D = (20 – 17), F = (<17).