Towering Heights Project

Planet Holloway Physics

**Objective**: Design and build one of three towers to hold between 1 to 15 kg using only popsicle sticks (4 ½ x 3/8) and glue. The closer to 15 kg, the more points you earn. (*Do not use* tongue depressors, which are double width, or coffee stir sticks or balsa wood).

**Requirements**: The tower must cross a 12” gap. The edges of the testing tables will be 12” apart. This means the tower must be longer than 12”, I know that seems obvious, but every year someone comes in with a tower that is too short across the base and therefore fails. The tower may not extend below the plane of the tabletop, but anywhere above the tabletop. This means you are allowed an unlimited amount of support legs (sort of, there is a limit to the number of sticks).

The tower must allow for a 3” x 3” x 2” testing block to be located at the center of the tower with access to the 1 ½” x 1 ½” x ¼” hook on the bottom of the testing block. It is from this block that the bucket holding the test weights will be added. You may decide where the block will be placed on your tower, but it must be over the gap between the tables. Also, the bottom of the testing block must be at or above the selected height. Since the bucket will hang below the tower, a rope must be able to pass straight down unimpeded through the center of the tower from which the bucket will hang. Therefore, leave a 1 ½” x 1 ½” open shaft down the center of your tower for the loading bucket system. Be sure you know what the loading device looks like before you build your tower. Remember, if I cannot load the bucket on your tower, your best possible score is a D.

There is no limit to the amount of glue you may use, but glue is to be applied only between wood. Therefore, no glue should be visible on the tower. Glue over the outside of the wood will be penalized. Avoid drenching joints in glue. Design is very important, so research, plan and test before building your final tower.

**Tower options**:

* Option 1 – (worth 140 points) 8 inch high tower. Popsicle stick limit 160. You must show how many popsicle sticks you used in your diagram.
* Option 2 – (worth 160 points) 16 inch high tower. Popsicle stick limit 260. You must show how many popsicle sticks you used in your diagram.
* Option 3 – (worth 180 points) 24 inch high tower. Popsicle stick limit 350. You must show how many popsicle sticks you used in your diagram.

**Research**:

* (Optional) Identify different types of joints used in real towers and the pros and cons of each style.
* (Required) Include a sketch of your tower that clearly illustrates the number of sticks used and a description of key parts. Explain the strengths and weaknesses of your design and estimate how much you expect you tower to hold.

**Build**:

There are many ways to build your tower, but remember the glue will take time to dry. Consider building in sections, then assembling the sections after they have dried. Allow for 6-12 hours dry time typically before adding any weight. Full curing usually takes 24 hours for most glues. Clamping the sections together while drying also increases the bond strength.

**Grading**: The tower is worth 200 points.

Scoring for tower –

|  |  |
| --- | --- |
| Fail | Tower fails to meet all required criteria (over 12” long, over 8” high “clearance”, only popsicle sticks and glue, can accommodate testing block) and therefore cannot be tested |
| D | Meets requirements, but cannot hold empty bucket |
| A-C | 2 points per kilogram added to the bucket (max 15 kg) |

Good luck and have fun!