Systems: Lesson 10

Built System

# Introduction

The sparkling white tower of the new eastern span of the Bay Bridge, a mere 20 years (!) in the making has inspired envy in the communities of Menlo Park and Fremont, the landing points of the Dumbarton Bridge. These communities are seeking proposals for a new design for their bridge and your team is on a tight deadline to enter a model in the competition.

# Objective

Your objective with this lesson will be to build as attractive as possible model bridge as rapidly as possible, using as little materials as possible. The materials will be supplied to you and you will have an opportunity to experiment and prototype your design before the final competition.

This team activity will take place in two sessions, a practice session on Monday 4/28 and the final competition Wednesday 4/30.

# Submission

The design constraints on your model are these:

1. It must span 2 feet
2. It must support a 2 pound weight placed at mid-span. (Dimensions of the test weight: 5 1/2” x 2 1/4”)
3. It cannot be physically connected to the test emplacement except through gravity

Your construction materials (supplied) shall be limited to the following :

1. 50 Popsicle sticks
2. 5 hot melt glue sticks
3. 8 feet of twine
4. 10 rubber bands

Your tools will be:

1. Hot melt glue gun
2. 1 piece 150 grit sandpaper
3. X-acto knife or equivalent
4. cardboard cutting pad

# Competition Rules

On Monday 5/5 you will be randomly assigned into teams of 2. You will have approximately 1.5 hours on that day to experiment and prototype a design for your bridge with supplied materials and tools.

The competition will take place on Wednesday 4/30. Construction time will be 60 minutes. Each team will be given the same material set and will construct its model from scratch. No pre-built components may brought into the competition.

The models will be scored on three dimensions as follows:

1. **construction time:** all teams will be started at the same time, and each team will receive a time score based the team’s declaration of completion. *Note: after each team has called time its model will be tested to see if it can support the required weight; any model that fails the test will be eliminated.*
2. **amount of materials:** each team will be issued the same materials set and will return all unused materials when complete--the difference will be the materials score
3. **aesthetics:** a vote will be taken regarding the aesthetics of all models that meet the constraints

The values from these 3 dimensions will be combined in an equal weighting to produce a final score for each model. Note that your team’s competition score, though conferring important bragging rights, does not impact your grade for this lesson.

# Learning Goals

* practice thinking systematically about physical structure
* experience with the interaction between time, cost and aesthetics
* practice collaborating creatively towards a tightly defined outcome

# Grading Rubric

| **Quality** | **Pass (1)** | **Fail (0)** |
| --- | --- | --- |
| Span | Model spans required distance within allotted time | Model does not span |
| Load | Model supports required load | Model does not support the required load |
| Collaboration | Student is an enthusiastic and supportive team member | Student does not collaborate well |

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