

Todd Miller TESI 5

This lesson plan will be the culminating project in a unit on construction and engineering I already do in physical science. Currently this unit is tied to earthquakes and seismic hazards and the current project has been to build a tower out of popsicle sticks that must be able to survive and “earthquake” on a shake table for thirty seconds. The students enjoy this activity a great deal however it takes so long to build a tower that there is no possibility of changing construction techniques to see what the effects might be.

By requiring students to do multiple experiments, data collection and controlled changes I believe they will get more out of the project. Before this activity I will use the same preliminary activities I currently do to teach basic engineering concepts such as compression, tension, shear, torsion, beam and post loading and so on. These include such activities as, spaghetti column strength holding maximum weight two inches high with a single sheet of paper

I will also do the demonstrations that Murray Gillis did showing the effects of aggregate size and shape as well as the importance of binders and the effects that the amount of these binders has on concrete strength.

Concrete Beam Building Challenge

The objective of this contest is to build the strongest concrete beam possible. All students will have access to the same materials. You may, and must, vary the proportions of cement, water, aggregate size and amount to achieve the strongest beam possible. All beams will be 1 1/2” X 1 1/2” X 24”.

Materials:

Pit run gravel, this is gravel that has simply been dug from the ground, it will contain mostly rounded shapes and will consist of many different sizes.

Crushed pit run, this is pit run gravel that has been crushed but is a mixture of sizes

Sieve screens of various sizes, these will be used to size the aggregate and sand.

Portland cement

Mixing trays/buckets

Wooden mold

Plastic wrap release film

Measuring cups

Water

Construction rules:

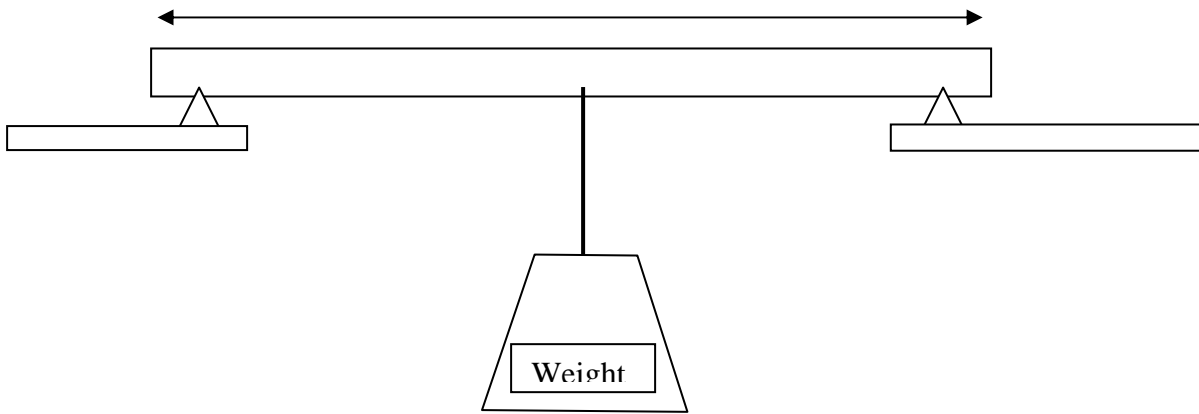
Your group will grade your own aggregates, this mean sort them to the preferred sizes. The choice of what proportions to use is entirely up to the team members.

You will also choose what amount of Portland cement and water to use.

You may build as many beams as you desire, however the amount of time in class is limited.

Competition:

Your group will build a minimum of three beams. The beam that holds the most weight when tested on as shown below will receive 120% of the possible credit.



All beams will be due to be tested on three dates to be announced.

A plastic bucket will be suspended under the beam and the student will add weight to the bucket until the beam fails. Failure is defined as when the beam deflects a distance of 15% of its unsupported span or when it breaks.

Grading:

Grading will have these components:

- 1) Participation - 50% - a daily score for on-task time with deductions for off-task time.
- 2) Performance- 25%- in order to get full credit here you have three options:
 - a) your best beam must carry at least 80% of the weight of the winning beam.
 - b) construct at least one extra beam during your own time.
 - c) analyze and write a report detailing why your beam failed. You will also need to analyze the video of your test.
- 3) Data collection- 25%- this needs to be complete, organized, clear and neat. This will need to include but is not limited to:
 - a) percentage of different sized aggregates and sand and cement.
 - b) amount of water.
 - c) cure conditions
 - d) amount of weight held.