Structural Engineering
2012

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Why I Love This Project

- It’s Cheap!!!!
- Balsa Wood Bundles-
  1/8” x 1/8” x 36”
- BalsaUSA.com
  - .15 each
- Modern School Supplies
  - 40 pack- $12.43
  - 500 pack with cutter- $150
Cutting Tools

- Super Easy Cutter
  - Modern School Supplies-$14.99

- X-acto Miter Box
  - Modern School Supplies-$12.99

- On a Budget?
  Split apart by hand and use sandpaper
Compression Testers

- Prices vary - ranging from $300 to $3000
- Kelvin
- Pitsco
- Paxton-Patterson
On a Budget?

- A home-made compression tester with some weights will do the trick!
What You’ll Need to Build Your Own Compression Tester

- Bucket
- Weights/Sand
- S-Hook
- Bolt
- Chain (check lb. strength)
- Wooden Board (drill a hole in the center)
- Small wooden testing block (drill a hole in the center)
- Grams Scale and Kilogram Scale
  - Grams scale measures the balsa wood beam weight for efficiency testing
2012 Structural Engineering

- On-site Event
- Pre-conference portion- Students may bring two copies of a prepared drawing on 11”x17” graph paper (1/4” grid) attached to pin board (foam core board), at least 12” x 18”, to on-site event. Cover with wax paper for construction

- Tools/Materials and Safety Glasses provided by NJ TSA
- 1.5 hours to complete a balsa wood beam
- Structure is destructively tested
  - 2012- amount of weight held determines a winner
  - 2013- efficiency ratings are calculated; ratio of beam weight and amount of weight held
Materials Provided by NJ TSA

- Safety Glasses
- 20’ of 1/8” X 1/8” Balsa Wood
- 1 ounce CA glue
- Cutting Tool
- Straight pins
- Simple Clamps
- Cutting surface
- Ruler
- Sandpaper
- Marking device (pen/pencil)
Specs for 2012 Structural Engineering

- 2012 Beam Length- 10"
- Beam Width- 1½ ”
- Beam Height- 2”
- Keep all tolerances for the above specs within ¼“.

- No building below the plane of abutment
- Beam must rest on top of the abutments
  - Span between abutments: 8” (2” less than the length)
- Beam may not touch the face of the abutment

- Laminations- gluing two sticks together longitudinally (grains following in the same direction)
  - No more than 2 per beam
Structural Engineering Testing

- Beams are destructively tested using a compression tester.
- Testing Block - 3/4” thick, 2 3/4 ” width, 4” long
- Testing block will sit 2” above plane of abutment.
- Testing Rod - ½ ” in diameter (center of testing block)
  - Your beam needs to provide clearance for the testing rod throughout the center.
Disqualifications and Deductions

- Disqualifications/Beams not Tested
  - Pins still in place
  - Center blocked from testing rod to fit through
  - Total of greater than ½” off from dimensions (this may include two dimensions totaling over ½” difference)
  - 3 or more laminations
  - Failure to follow more than 2 regulations

- Deductions of 20%
  - Failure to submit a plan
  - Structure is ¼” less than or ¼” greater than the required length (10” length has tolerances of 9-3/4” to 10-1/4”)
  - Failure to follow regulations
Changes from NJ TSA Supplement

- Tools, materials and safety glasses provided by NJ TSA
- Time change from 2.5 hours to 1.5 hours
- Beam Length is 10” (length changes yearly)
- Bring prepared sketches to conference (each group may bring two; one per partner)
- No finalists; the top three of all tested beams will be announced at the awards ceremony.
Diagram of Beam Testing

- Testing Rod
- Testing Block
- Abutment
- Span
Some Great Web Resources

- West Point Bridge Design
  - [http://bridgecontest.usma.edu/](http://bridgecontest.usma.edu/)
  - Free Software Download
  - Contest for ages 13 through 12th grade Notebook

- Physics Balsa Bridge Contest
  - Lots of photos and links to information on bridges, balsa wood, etc.
Thank You!!!!

Any Questions???
Spaghetti Towers

- Introductory activity to introduce the concepts of structure, support beams, design loop
- Get your materials and directions and you may begin working in your groups.
- Testing time will be up at 10:55.
- Good Luck!!!