

STOP THE STRETCHING!

DESIGNING AND TESTING COMPOSITE MATERIALS TO BE STRONG AND STIFF IN TENSION

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Constructing the Tensile Test Stations

Materials (to build 1 test station)

- At least a 14' section of link chain
- An approximately 8" section of link chain
- 2 3/8" x 6" round head bolts threaded entire length
- 6 3/8" hex nuts
- Duct tape
- 5 gallon pail with strong handle (school floor wax buckets)
- Small, pea stones (uniform size) or sand - enough to fill the 5-gallon pail (sand is messier)
- Ruler
- Small coffee can (16 oz.)

Assembly

- 1) To make the top holder, loop the chain around something sturdy on the ceiling and cut it so the two ends will be hanging at a comfortable level off the floor (see Figure 1). Slide a bolt through one of the bottom links of the chain and secure the chain against the head of the bolt with one of the nuts; this will clamp the chain in place.

Thread another nut onto the bolt allowing at least a 3" space between the nuts already on the bolt. Slide the other chain link on the bolt and secure it with another nut.

Wrap duct tape around the exposed threaded part of the bolt so it will not cut into the plastic strips being tested.

- 2) The bottom holder is made the same way, except you only need an 8" length of chain which you will put through the handle of the bucket (see Figure 1). One trick to help reduce the bucket sliding is to ensure an odd number of links in the bottom chain.

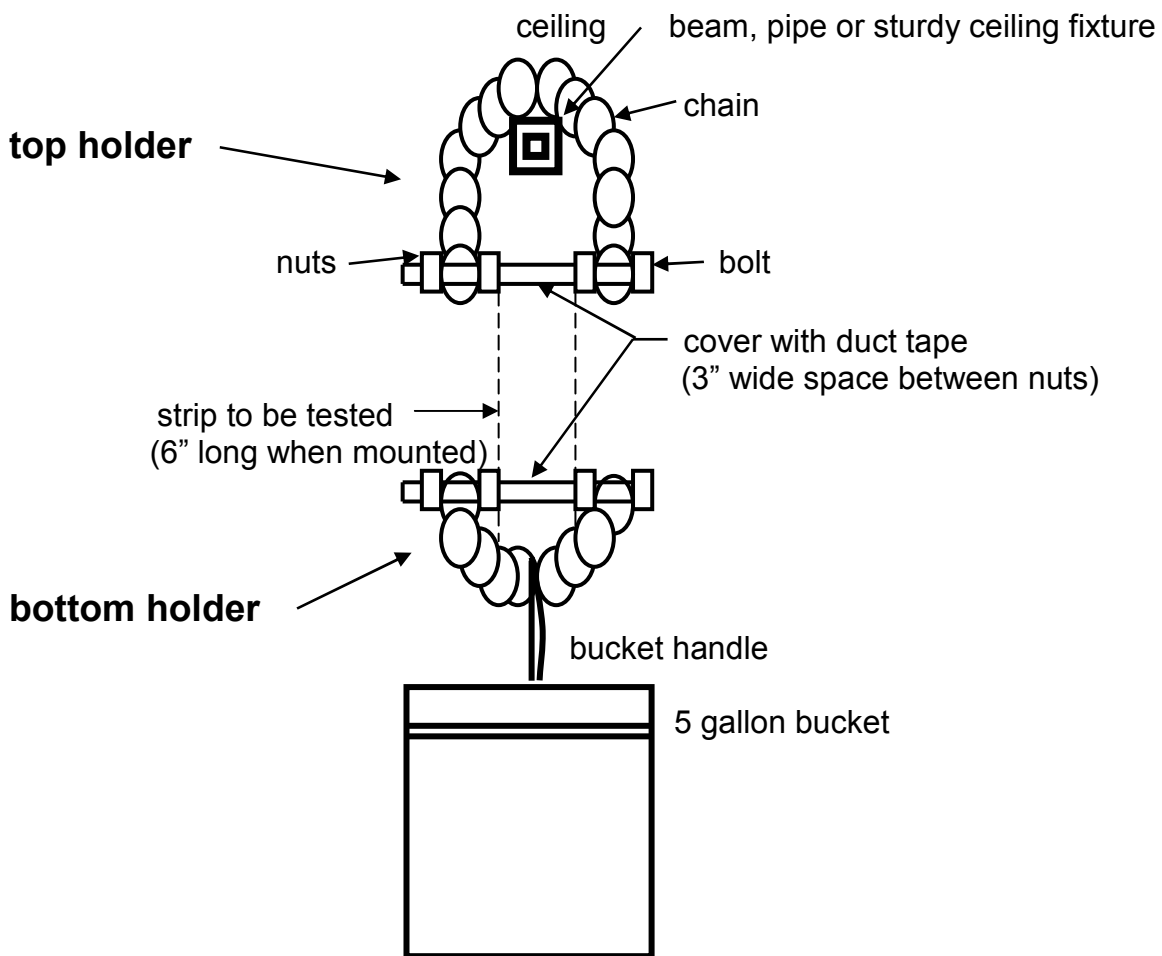


Figure 1: Assembly of Tensile Testing Station

IMPORTANT NOTES ON RUNNING THE LAB:

- Set up only one or two test station. This will focus all students' attention on materials testing and they will learn how to improve their second designs after watching the results of other teams' tests.
- Demonstrate testing of a sample test strip of unmodified plastic sheeting so that students will understand the testing methods as well as having a standard for comparison of their composite design. Run the First Test on a single 4 mil thick plastic strip (3" x 18") and have a student record the data on the board. Have the whole class graph these results on the grid provided in their packets. By doing the plain plastic test, students will be able to really see the improved stiffness and strength of their composite material designs.
- Ensuring uniform testing is very important given the relatively small measurement differences. It is important to make sure that duct tape does not overlap the 5" testing length. In addition, it may be necessary for the teacher (or at least one consistent student) to take measurements of the elongation of all strips so that the data gathered can be compared.
- Something should be placed to catch the bucket after each test strip breaks, depending upon the bucket's height.
- All students should wear safety glasses and keep their feet away from the area where the bucket will land.