

Structures and Designs

Lab #3 Beam vs. Arc Bridges

NAME: _____

Due: _____

Purpose:

1. To determine which shape is the strongest under bending stress, a beam or an arch.
2. To determine which shape of arch is the strongest.

Hypothesis: #1

#2

Material: stack of books, manila paper, weight scale, clay and scissors

Procedure:

- 1) Make a chart on a piece of loose leaf that includes the headings; span, maximum load, and shape.
- 2) Take the manila paper and cut it in half, lengthwise.
- 3) Using the one piece of paper try to make a freestanding arch (do not deform your paper)
- 4) Record what happened.
- 5) Cut another piece of manila paper in half, lengthwise.

Testing our two shapes

- 6) Using books stack them so that they are as high as either end of the square bridge.
- 7) Take the left over manila paper and make a beam across the top of the square bridge from one book to the other. It should look like this.



- 8) Place balls of clay on the top, CENTER of the bridge until it collapses.
- 9) Record the amount of clay that it held. (an actual value ex. 30 grams)
- 10) Do the same procedure only using an arch under the roadway instead of a square. (Note: to save time on the next part, measure the distance between the two books and record it somewhere.)

Testing the arches

- 11) Move the books closer together making the arch higher.
- 12) Measure the distance and test the strength of the arch.
- 13) Repeat this with a smaller span. Record the span and max load.

Analysis questions: (answer on loose leaf)

1. Why couldn't the arc stand up on by itself?
2. What did the books on either end of the arch represent in a real bridge?
3. In what way do the books support the arched card differently than they do the beam?
4. What is "span"?
5. Why did the arc bridges hold more weight than the beam bridge?
6. What shape of arc was strongest?

Sources of Error: (on loose leaf)

Conclusion: (on loose leaf)

FEEDBACK		
<ul style="list-style-type: none"> <input type="checkbox"/> Incomplete or not handed in by due date <input type="checkbox"/> Messy or missing data <input type="checkbox"/> Poor knowledge exhibited in analysis questions <input type="checkbox"/> Few or weak sources of error <input type="checkbox"/> Incorrect or unclear conclusion <input type="checkbox"/> Redo and parent signature required 	<ul style="list-style-type: none"> <input type="checkbox"/> Complete by due date with accuracy <input type="checkbox"/> Accurate data <input type="checkbox"/> Good knowledge exhibited in analysis questions <input type="checkbox"/> Credible sources of error <input type="checkbox"/> Conclusion needs support 	<ul style="list-style-type: none"> <input type="checkbox"/> Completed by due date with detail <input type="checkbox"/> Accurate & clean data <input type="checkbox"/> Excellent knowledge exhibited in analysis questions <input type="checkbox"/> Insightful sources of error <input type="checkbox"/> Supported conclusion