



## Curiosity Guide #207

### Bridges

Accompanies Curious Crew, Season 2, Episode 7 (#207)

#### Lamination Power

Investigation #1

#### Description

How can you make a simple paper bridge hold more weight?

#### Materials

- Four notecards, 4 inches by 6 inches
- Rubber cement or a glue stick
- 2 large plastic cups
- Tape
- Washers
- Ruler
- Laminated plywood, to examine when reading explanation

#### Procedure

- 1) In advance, glue two of the 4 by 6-inch cards together. Let dry.
- 2) Turn the two plastic cups upside down.
- 3) Position the cups so that they are four inches apart at the top.
- 4) Tape the cups down to the table.
- 5) Stack the two free notecards together.
- 6) Balance the notecards on the cups so that the cards span the cups like a bridge.
- 7) Ask a friend to predict how many washers can be placed on the notecards without collapse.
- 8) Test your friend's idea.

9) Now put the glued cards on the cups. Repeat the experiment with the washers.

10) Did the second beam hold more?

### My Results

### Explanation

The cards that were glued together are stronger than the 2 stacked cards, which could slide away from each other under the load. When material is glued or bonded together, it is called lamination.

Plywood is a good example of lamination. Plywood has many different, thin layers of wood that are glued together. When plywood is compared to a solid piece of wood with a similar thickness, the laminated wood is stronger. Lamination is a good example of providing strength while reducing weight.

In bridge design, civil engineers must consider material weight and strength. Other examples of engineered beams include trusses, I-beams, and hollow square tubes. Each of these beams lowers the weight while maximizing the strength.

**Something to think about:** Have you ever walked on a fallen tree or branch across a shallow stream? If you did, you were using a bridge. Bridges are natural or manmade structures that can be used to cross over some kind of obstacle. Obstacles can be a river, a road, a ravine, or even a theater auditorium where they set up the stage lights. Check out the other Curiosity Guides from this episode on Bridges to discover the different kinds of bridges and see what they all have in common!

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