

CARDBOARD COLUMNS



GOAL

Students re-engineer a collapsed column and predict how performance will change.

GRADE LEVEL

Upper elementary

Can a toilet paper tube support your weight?

MATERIALS

- 3 empty toilet-paper tubes
- sand or salt
- marbles or pebbles
- dishpan, tray, or cardboard box lid
- masking tape, sturdy chair, funnel

1. Place an empty dishpan, tray, or box lid on the floor. Stand an empty toilet-paper tube (the column) on end in the pan.
2. While holding onto the back of the chair with both hands (to keep yourself steady), gradually press straight down on the top of the column with one foot. Continue increasing your weight on the column until it collapses. How much FORCE did it take to crumple or break the column: not much, some, pretty much, or super strong?

3. Observe the collapsed column to see where it failed. How can



you make the second column stronger, using only tape and sand? Make a prediction, then repeat step 2.

4. Would there be a difference in strength between a column filled with small particles like sand or salt, and a column filled with big particles, like marbles or pebbles? Make a prediction and test it.

Columns are often used to hold up heavy loads, such as the roofs of buildings. The heavy load pushes on the column, putting it in compression. So, engineers need to design columns that are very strong under compression in order to keep buildings safe.

This activity from American Society of Civil Engineers: Building Big.



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