

AN EXPERIMENT ABOUT ENGINEERING

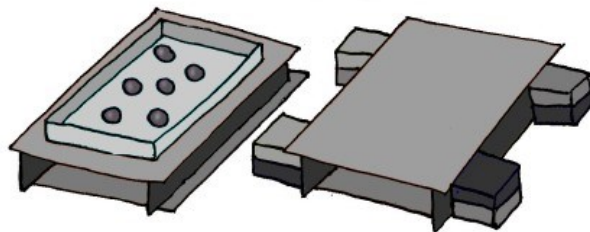
BUTTRESSES

What you will need:

- Cardboard – one large rectangle and 2 thin strips
- Tape
- Building blocks
- A flat container
- marbles

What you will do:

- 1 Make a simple building by taping the 2 strips of cardboard to the bottom of the larger piece so that they form walls and a roof. **USE A SINGLE PIECE OF TAPE TO ATTACH EACH WALL.**
- 2 Carefully stand your building up on a table then balance the container on top.
- 3 Start gently putting marbles into the container, one at a time until your building collapses. Write down how many marbles it held.
- 4 Lets try some buttresses.
Make 4 cubes from blocks that are almost as high as the walls of your building. Put each a cube next to the wall close to each corner of the building.
- 5 Place the container back on top and test the structure with the marbles again. How many marbles can it hold now?

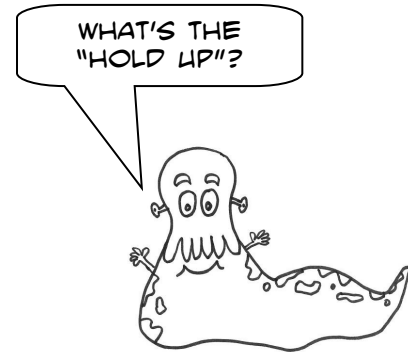


What is going on?

Buttresses are an ancient method of supporting walls. By building buttresses out from a building you can keep the inside of the building more open. Looking at the results of your experiment, which way do you think the roof pushes on the walls?

Monster Challenges:

- Find some photos of building that have buttresses. Many stone buildings will have them. Are there any buildings near you that have buttresses? Perhaps a stone church or bridge?
- Experiment with buttresses of different sizes and shapes to see which add the most strength to the walls.



TEACHING NOTES:

Monster Sciences Experiment: Engineering EG04

Topic: Engineering

Key Concepts:

- ♦ Buttresses add strength and stability to vertical walls

Resources:

- Investigation Record IR01– one copy per student
- Experiment Description Engineering EG04– one copy per student
- Cardboard, tape, container, marbles, building blocks

Lesson Notes:

When doing this experiment with younger students you may want to cut the cardboard prior to the lesson.

As a class discuss the experiment prior to undertaking it, and students should complete the sections of their Investigation Report IR01 from "Title to "Hypothesis".

Students must add the marbles one at a time and carefully so as not to push on their structure.

It is important that students only use one piece of tape for the walls because it makes it easier to see the difference the buttresses make.

What should happen in this experiment, and why?

The original structure should collapse fairly quickly, with at least one wall splaying outwards.

When the buttresses are added the structure should become stronger and more stable, and be able to hold up many more marbles.

Follow up discussion questions:

- Buttresses stick out from the wall on the outside of the building. Do they need to be added to the inside of the building too? Why or why not?
- What are the disadvantages of using buttresses? (Hint to teacher: they take up space and resources)
- From our previous experiments, what other ways could we build stronger walls without using buttresses?