

# HACK

## Ahoy Maker

How do engineers design and construct buildings to withstand earthquake damage?

Get ready to put your hard hats on because today you will become an engineer and learn how to build your own model structure using toothpicks and marshmallows. Experiment to see how earthquake-proof your buildings with limited resources.



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**Difficulty: Easy**

**Time required: 30 minutes**

**Learning objectives**

After this activity, you should be able to:

1

Identify some of the factors that make buildings earthquake-proof, such as cross-bracing, large “footprints”, and tapered geometry.

2

Model an earthquake-proof structure using simple materials

3

Understand why engineers need to learn about earthquakes

## Materials

For this project, you will need:

- 30 toothpicks
- 30 marshmallows
- 1 Table



## Before you begin

For this challenge, you are limited to using only the materials you have on hand to make the structures. You can make large or small cubes or triangles using full-size or broken toothpicks. You can also use [cross-bracing](#) to reinforce your structures.

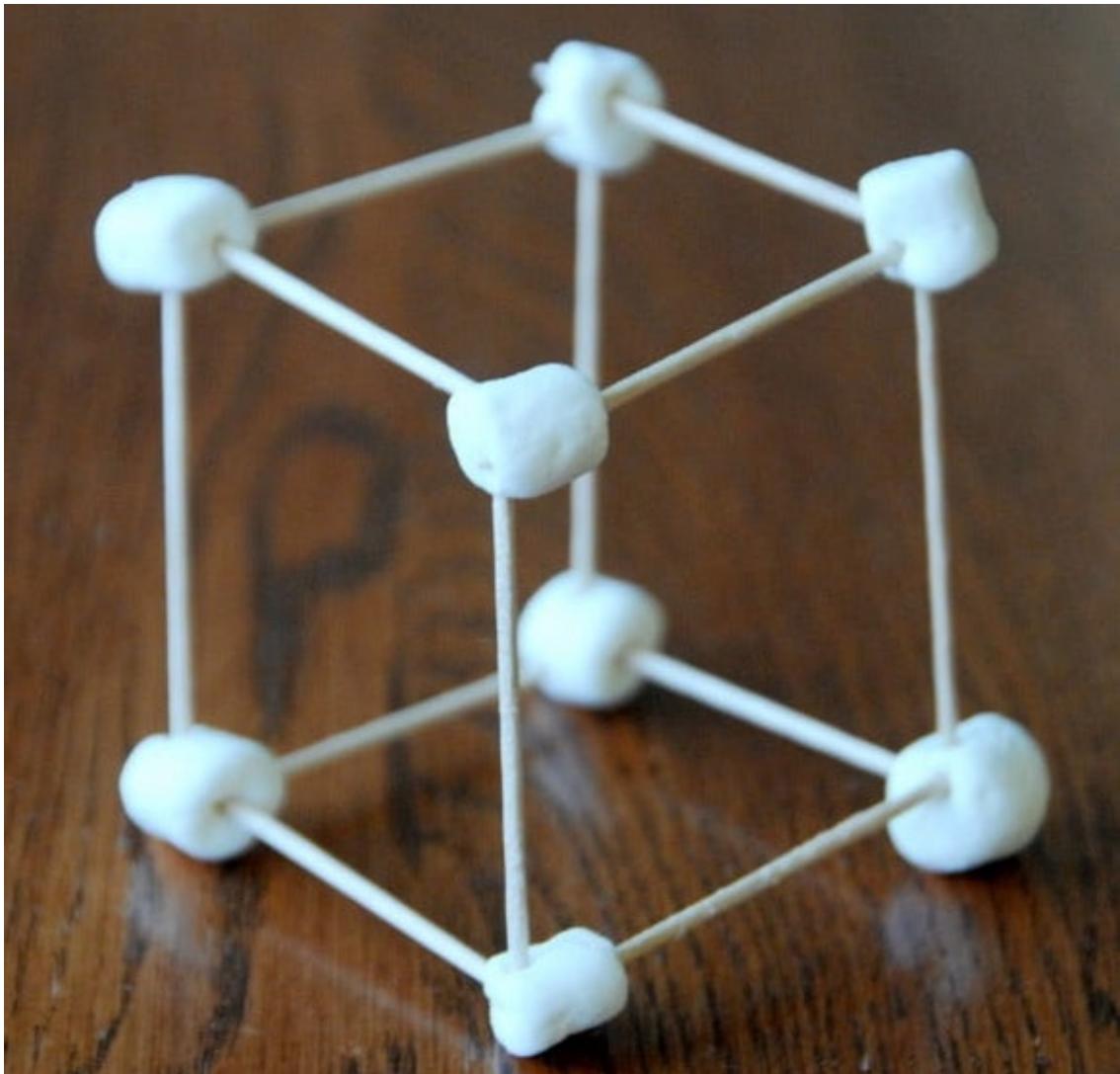
Here is an example of a building reinforced with cross-bracing. (Hint: X marks the spot)

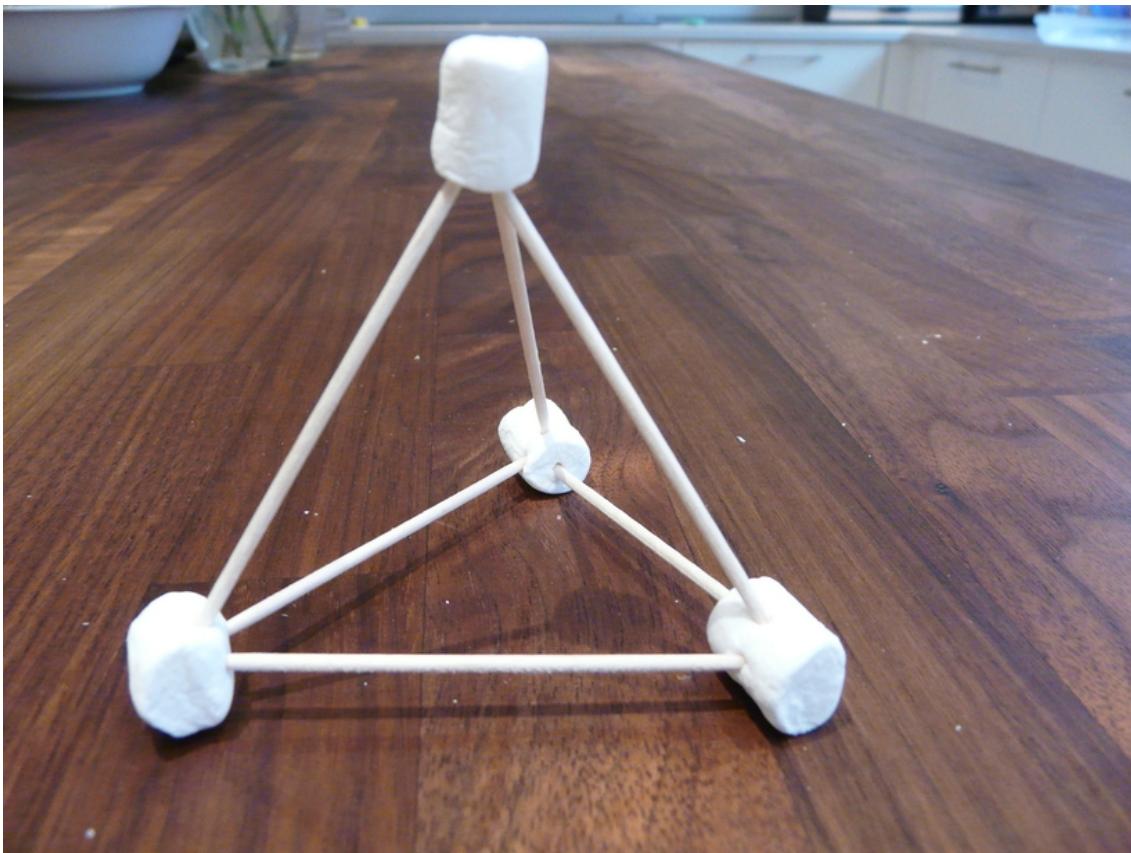


To make it more challenging, try to meet one (or more) of the following rules or create your own. Buildings must...

- Be at least 2 toothpicks level high
- Contain at least 1 triangle
- Contain at least 1 square
- Contain 1 triangle and 1 square

Below are examples of a structure made with squares and triangles.





## Build. Test. And build some more.

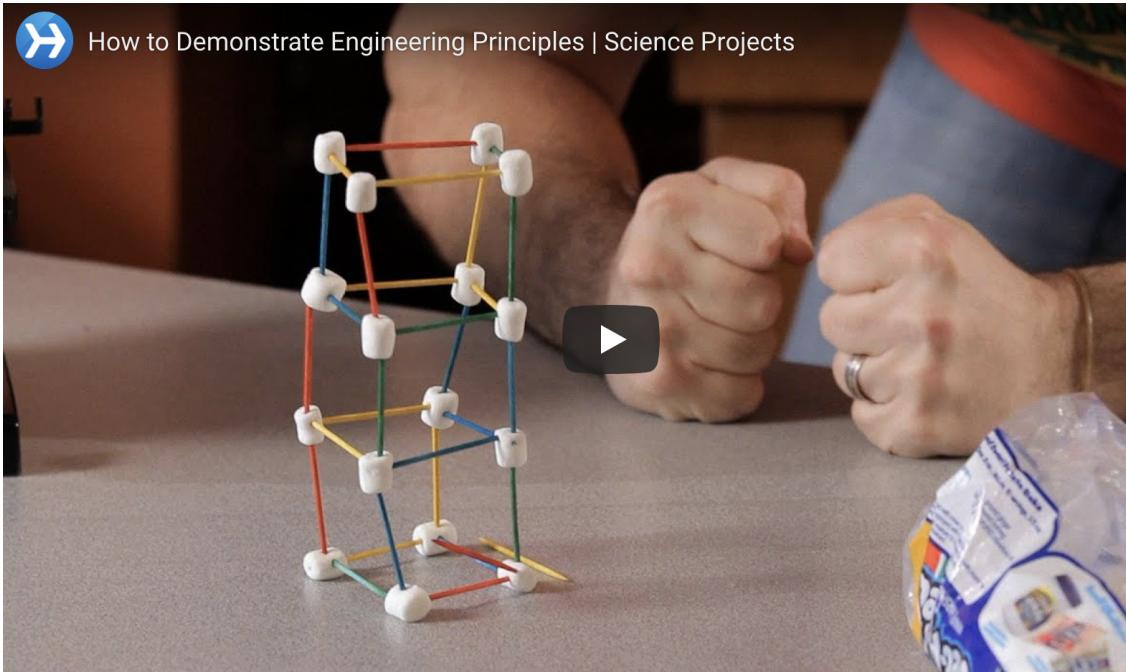
When your structure is ready, place it on the table and shake (or pound) the table quickly to simulate an earthquake.

If your building toppled, here are a few questions to ask yourself:

- Did your building topple? Why or why not?
- Would it help to make the structure taller or shorter?
- What can you do to make the structure stronger?
- Would it help to make the base (or bottom) bigger?

Now that you've thought about it, build another structure and try again. How high can you make your earthquake-proof building?

If you have any questions, here's a video for this challenge:



**Happy making!**

-Team Hack