Earthquake-Resistant Structure Lab: Build It to Withstand the Shake

Background Information

When earthquakes strike, buildings shake. Engineers design structures to resist these forces using wide bases, strong joints, and flexible materials. In this lab, students act as engineers to build and test model structures, learning what design choices make buildings more stable during an earthquake.

Objective

- Design and build model structures that can withstand simulated earthquake shaking.
- Test how different shapes, materials, and building techniques affect structural stability.
- Understand how earthquake-resistant features reduce building damage.

Develop a Hypothesis

Which design elements (e.g., wide base, cross-bracing, low height) will make your structure more stable during shaking? *Write your hypothesis as a complete sentence.*

If . . . _____

_____ ,

then . . . _____

_____ .

Materials

- Cardboard base
- Toothpicks
- Mini marshmallows
- Ruler
- Stopwatch

Procedures

Step 1: Design & Build Your Structure

1. Design a 3D structure on top of your cardboard base using marshmallows and toothpicks.
2. Minimum requirements:
    - Fits within the perimeter of your cardboard base.
    - At least **10 cm tall.**

Step 2: Test Your Structure

1. Place your structure on the Shake Table.
2. Shake the table side-to-side for **15 seconds**. Keep motion consistent.
3. Observe: Did the structure tip, break, or stay standing?
4. Record results.

Step 3: Retest Your Structure

1. Modify your structure and retest up to 2 more times.

Data Table

Trial	Structure Design Description	Time Withstood (sec)	Damage	Notes on Changes
1				
2				
3				

Conclusion

Was your hypothesis supported? Why or why not? *Write your response in complete sentences.*

Analysis Questions

1. What building features helped your structure survive?

2. Why is a lower center of gravity important?

3. How did cross-bracing or shape affect the outcome?

4. How can engineers use tests like these before building full-scale structures?

Adapted from:
https://discovere.org/engineering-activities/build-an-earthquake-resistant-structure/