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| Strand: <b>8.4</b> | Standard: <b>8.4.5</b> | Episode 5 | <b>Big Idea:</b> There are patterns in the occurrences of natural hazards and these patterns can be used to predict future catastrophic events. |
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| <b>Title:</b><br>Toothpick Towers | <b>Time:</b><br>45 - 60 minutes | CCCs<br><u>Structure and Function</u> | Practices<br><b>Construct Explanations and Design Solutions</b> |
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### Episode Snapshot

This is an optional episode that explores one way people have attempted to use technology to mitigate the effects of a natural hazard, in this case earthquakes, by modifying structures. Students will **design** towers to resist movement generated by earthquakes. There are many ways to approach this activity. This episode provides one way it might be done.

#### *Gather*

Begin by showing the students videos of various ways humans adapt the structure and function of buildings to minimize earthquake damage. Examples:

Earthquake resistant buildings in Japan: <https://www.youtube.com/watch?v=tF204Pgf-eo>

Swaying buildings in Japan: <https://www.youtube.com/watch?v=g0cz-oDfUg0>

Earthquake proof buildings in LA: <https://www.youtube.com/watch?v=iZoHoPFHAtw>

Give students time to investigate some building designs that have been used to protect buildings from earthquakes.

#### *Reason*

In small groups, students create a blueprint **design** for a toothpick tower. The best towers will incorporate features from the building designs they researched (tapered shape, cross-bracing, etc.)

#### Rules:

Groups will be given only 30 toothpicks and 30 mini marshmallows. No other supplies may be used.

The tower must be at least two toothpick levels high.

The tower must stand on its own without help.

Once students have created a design on paper, give them time to construct their tower.

#### *Communicate*

Test the towers. Place marbles in a roasting pan and place a board on top of the marbles. Place each tower on the board and create an earthquake by moving the pan back and forth. You may use different parameters to determine the success of the towers. Tallest tower, tallest tower that lasts at least five seconds, tower that stays up for the longest time, etc.

Allow students time to redesign their towers and test again.

**Assessment:**

The assessment for this episode is how well the student's final redesigned towers can withstand an earthquake.

**Materials, resources, handouts, etc:**

Toothpicks (30 for each group)  
Miniature marshmallows (30 for each group)  
Shallow pans  
Marbles  
A flat board that can fit inside the shallow pans