

## DIVE INTO DESIGN

Duration: 90 minutes

Institution: The Tech Museum of Innovation

Skill level/Age Level: Grades 3-8

Group size: 25

## INTRODUCTION

Learn how to engage your students in the engineering design process through participation in hands-on design challenges. Staff will experience two mini design challenges related to The Tech Challenge 2015 on Seismic Engineering. All staff will leave with two age-appropriate design challenges they can use at their site(s) and the option of taking their creation. Come build your own solutions and see how much fun this would be to do with students of all ages and backgrounds.

The Challenge: Build a skyscraper that has limited roof drift.

## KEY CONCEPTS AND/OR SUBJECT AREA

Design Challenges are all aligned to the engineering strand of NGSS. The engineering design process engages students in the 4Cs, which are critical thinking, communication, collaboration and creativity. The activity is active (hands-on), meaningful (connected to real-life problems like engineering for earthquakes), collaborative (working teams), supports mastery (of 4Cs and other 21<sup>st</sup> Century skills like perseverance) and Expands Horizons (exposes you to engineering and other STEM careers).

## MATERIALS AND TOOLS

*Essential Materials:*

- Shake Tables
- Adhesives and attaching materials (glue, tape, rubber, bands, paper clips etc.)
- A variety of wires (insulated and metal and pipe cleaner-type materials)
- Different types of wood and thicknesses of paper
- Weights that can be used to load test materials (we suggest 1/2 –pint water bottles filled with sand. You will need 3 per group. Other objects that weigh approximately 1 pound can also be used).
- Team journals

*Optional Materials:*

- Popsicle sticks
- Foil
- Wire (Insulated, Metal)-variety of thickness

- Pipe cleaners
- Paper (medium thickness works best)
- Foam sheets
- Straws
- Coffee Stir Straws
- Rubber bands (multiple sizes)
- Paper clips
- String
- Masking tape
- Bendable plastic (e.g. transparency sheets)

### SET UP

Set up one station for each group as follows:

- Place a variety of materials at each group's station (5 per station).
- Place 3-5 sand-filled 1 1/2-pint water bottles at each station (or other 1-pound weights).

### FACILITATION TIPS

1. Criteria: (Design Requirements) The building must...
  - a. Be built on a 6"x6" base
  - b. Be at least 2' high
  - c. Have at least two locations where 1/2-pint water bottles can be placed
  - d. Be able to support an attach to a maker as its tallest height
  - e. Have a way to attach to the shake table
  - f. All team members must contribute
2. Constraints: (Design Limitations)
  - a. The building roof cannot drift more than 2" in distance (measured by the length of the marker marking)
  - b. Budget: you may only use the materials provided
  - c. Schedule: you have 13 minutes to complete this challenge
3. A building is successful if...
  - a. The building is still standing after a count of 10
  - b. No pieces have fallen off the building after a count of 10 (including the load)
  - c. Roof drifts no more than 2" in distance (measured by the length of the marker marking)
  - d. The building returns to its original position.

**MATERIALS SOURCES**

RAFT

**KEYWORDS**

- Design challenge Learning