

SHAKE TABLES

Simple Platforms for Testing Structures in Earthquake Country



Curriculum topics

- Earth Processes (Plate Tectonics)
- Forces & Motion
- Motor Skills
- Engineering/Design

Subjects

- Science
- Engineering

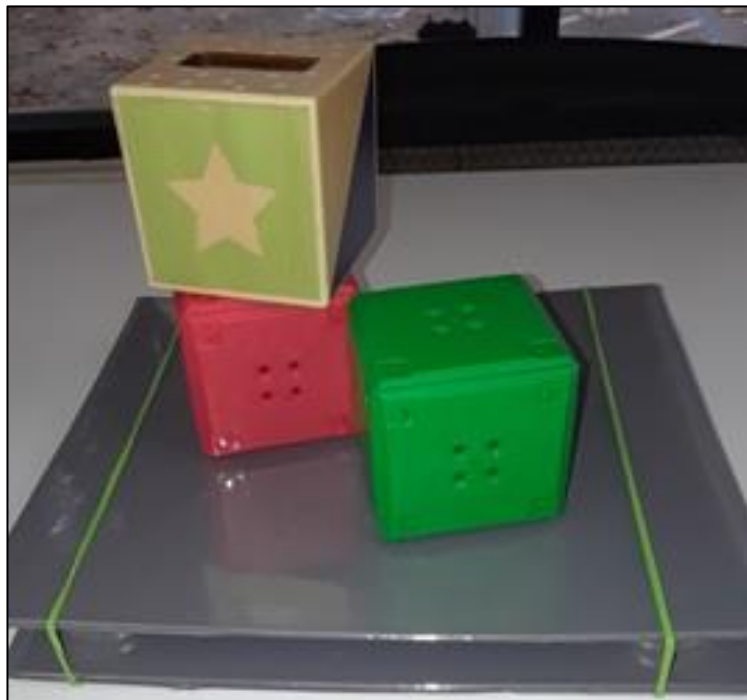
Grade range: 6 – 8

Serves: Each kit can be used by individual students or teams of 1-4 students.

Who we are: Resource Area for Teaching (RAFT) helps educators transform the learning experience by inspiring joy through hands-on learning.

The RAFT Shake Table provides a great opportunity to discuss earthquakes and other geologic events as well as how the energy released by earthquakes is measured. The picture above shows a cracked roadway affected by a strong earthquake.

Architects and engineers run simulations using models and shake tables to test the integrity of buildings and determine necessary reinforcements. With this kit, students assemble and use a very simple, non-motorized shake table to test the stability of structures made with a variety of materials (not included).



Share Your feedback!

<http://bit.ly/RAFTkitsurvey>

Materials

Materials in the kit may vary but generally, this kit contains the following:

- Binder cover, cardboard, or equal (2)
- Rubber balls (4)
- Plastic caps (4)
- Rubber bands, size #185 (2)

Facilitation

Put a book or other heavy object on a table so students can observe it. Push lightly on its side horizontally and gradually increase the amount of pushing force applied to the book. This simulates the pressure build-up along earthquake faults. Here are a few suggestions:

- Have students predict when the book/object will move.
- Ask them to share their ideas about how this simulation relates to shaking caused by earthquakes. Record student responses on a whiteboard or chart paper for later discussion/review.

Show the [shake table house testing video](#) linked in the Resources section on the next page to students, or have students access it on their own. Call on students to share their observations from the video. Mention to students that they will assemble a shake table, build simple structures, and simulate an earthquake to observe what happens to the structures they test. Be sure to have blocks, beverage lids, craft sticks, or other materials (not included in the kit) available for modeling simple structures to shake on the shake table.

To Do and Notice

- 1** Lay one binder cover or equal material, hereafter called a “board”, on a flat surface. Place a plastic cap open-side up at each corner of the board about 1 inch from the edges.
- 2** Put one rubber ball into each plastic cap (shown at right). Place a second board atop the rubber balls, aligning the top board with the bottom board.
- 3** Stretch one rubber band around both boards about 2-3 inches from one edge. Repeat near the opposite edge using another rubber band. Note: If the boards start to bend, adjust by moving the plastic caps slightly towards the rubber bands to alleviate the bending in the boards.
- 4** Create a structure using toothpicks, wooden cubes, or other materials to test on the completed RAFT Shake Table. Put the structure near the center of the board. Simulate an earthquake by pulling the top board out of alignment with the bottom board and then release it. Note your observations.
- 5** Repeat the simulation multiple times with the same structure, varying the amount of shaking by pulling the boards further out of alignment (making stronger earthquakes). Note your observations.
- 6** Expand your learning by building and testing new structures and/or by placing the structures on a variety of foundations such as clay, gelatin, or sand atop your RAFT Shake Table. Explore the [interactive earthquake simulation](#) linked in the Resources section on the next page.
- 7** Share your shake table exploration with RAFT! Submit photos/video via email: education@raft.net



Core Content Skills:

NGSS

Plate Tectonics and large-Scale System Interactions, Natural Hazards, Wave Properties, Developing and Using Models for Possible Solutions, Analyzing and Interpreting Data

Social Emotional Learning

- Self-awareness
- Self-management
- Responsible decision-making

The Science Behind the Activity

Planet Earth is a layered planet, with a dense, metallic core; a layer of hot, liquid rock (mantle); and a cold, brittle surface (crust or lithosphere). The crust of the Earth is broken up into several pieces, known as plates. Convection currents in the liquid mantle pull the plates, causing them to move against one another (plate tectonics). Most earthquakes occur where plates come together (plate boundaries). The state of California spans over 2 plates: the North American plate and the Pacific plate. The state is bisected by a very large and well known “crack”, the San Andreas Fault.

Earthquakes are measured by the Richter Scale, a logarithmic measurement system. In this scale, an earthquake of 5.0 represents a tenfold increase in amplitude (and about 31 times more energy released) than a 4.0 earthquake. An earthquake measuring 5.3 would be considered moderate, a 6.3 would be considered strong, and 7.0 or higher is usually considered severe. For historical reference, the 1906 San Francisco earthquake had a magnitude of 7.8, while the 1989 Loma Prieta quake (near Santa Cruz) measured 7.0. Injuries and deaths during earthquakes generally occur because of building or structure collapse or by unsecured objects falling from shelves. Therefore, building and testing models is very important because they can yield data that scientists and engineers can share with city planners, thereby helping to keep people safer in the event of an earthquake or related natural disaster.

Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

Feedback

Please comment on this kit by taking this short survey: <http://bit.ly/RAFTkitsurvey>. Let us know of any material concerns such as missing, broken, or poorly fitting parts as well as improvements or other suggestions.

Visit <https://raft.net> to view related activities!

Foam Faults
Your Room in an Earthquake
Wave Mobile
Interactions Between Earth’s Spheres
Brace Yourself
Motorized Shake Table

Resources

- Large shake table tests on houses - <https://bit.ly/3pzcQJb>
- Earthquake interactive simulation - <https://bit.ly/3vzUqss>