

Liquefaction

Objectives:

Students will understand the relationship between the type of soil and the susceptibility to liquefaction.

When is the Solid Earth not so Solid?

Dry soil

1. Hand out 4 buckets – each group fills each container $\frac{1}{4}$ full with one of the 4 soil types.
2. Students place the “house” (A small dense block) in the soil so that the house is into the soil about $\frac{1}{4}$ of the way down.
3. Gently shake each bucket while observing carefully. Start with a frequency of about 1 back and forth shake each second. If, after a minute or so the “house” remains standing, then the students can gradually increase the frequency of shaking. Continue until all the houses fall down.
4. Students record their observations, particularly about the time it took for the house to fall down, the degree to which each house shook, the way the soil held together (or didn't!), etc.

Adding Water

1. Have the students carefully replace the houses in the ground as before.
2. Add about 100 ml of water to each bucket. Have the students pour the water uniformly over the surface (not all in one spot).
3. Observe carefully and what happens to the water and the soil. Look carefully at the side of the bucket to see what is happening underground. Record observations.
4. Shake gently as before and record observations
5. Repeat the experiment, this time adding another 100 ml. By this time students should be observing liquefaction occurring in at least one container. If not, have them repeat the experiment, adding even more water.
6. Discuss the results as a class. Discuss the reasons why water doesn't drain as easily in fine-grained soil as in coarse-grained soil.

Liquefaction demonstration and discussion.

At this point, explain the concept of liquefaction and how it can seriously affect buildings that appear to build very solidly. Be clear that liquefaction only occurs during earthquakes – students may learn a misconception that liquefaction is inevitable on fill and other loose soil, but in fact this is only the result of the intense shaking from an earthquake.

Creating the Best Soil to build on

1. Challenge the students to create a mixture that will allow for good drainage, keep the house upright and keep the house from sinking (due to liquefaction). They may mix soils as they see fit
2. At the end of this activity, when students are satisfied with what they have created, have them explain to the class why they tested out the mixtures they did, and what they learned.
3. Note that you will have to sift the soil to re-use it! Also note that you'll have to figure out how to prevent students from putting soil in the sink!