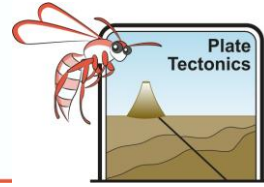


Surface Waves (L&R) – Teacher Notes



Seismic waves are energy waves released during earthquakes. These shock waves travel in all directions away from source and are impeded and deflected by the materials they travel through. A background to wave movement is provided in the “Wave Energy Transfer” activities.

There are two kinds of seismic waves:

1. **Body waves** travel through the body of the Earth. **P** waves are compressions that pulse through rock. **S** waves are also known as secondary, shake or transverse waves.
2. **Surface waves** are triggered when P and S waves are deflected to travel along the surface of the Earth. They are slower but much more destructive than body waves. Love (**L**) waves are polarised shear waves and Rayleigh waves (**R**) cause the ground to roll.

Movement from these waves can cause sediments to behave as a liquid. Liquefaction is particularly pronounced in poorly sorted sediments containing water such as those lying in old river channels in Canterbury in New Zealand. Whole suburbs have been rendered uninhabitable as houses sank into the ground and services were twisted and fractured. Because future earthquakes might cause the same problem building in these zones is prohibited.

AIM To model liquefaction during an earthquake

Materials per student or group

- A large stone, block of wood or Lego house.
- A beaker or plastic drink cup
- Sufficient dry seeds (sunflower, rice, lentils etc.) or dry clean sand to half fill the beaker
- Water

Method

1. Half fill the beaker with seeds.
2. Place the “house” or rock on top.
3. Shake the beaker rapidly side to side without spilling the seed.
4. Observe and report
5. Add water and repeat



Observation

What happened to the “house” when the beaker was shaken?

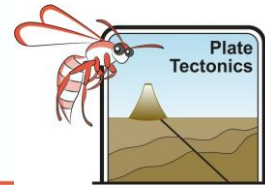
The “house” started to sink into the ground

What happened when water was added to the dry material?

The house sank more rapidly



Surface Waves (L&R) – Teacher Notes



The old hymn says:

*“Build on the rock, the rock that ever stands
Oh! Build on the rock and not upon the sands
You need not fear the storm or the earthquake’s shock
You are safe for evermore if you build on the rock!”*

Will building on a rock make your house safe from earthquakes?

It might save the house from surface wave induced liquefaction but it could still be shaken by S and P body waves.