



CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

Name(s) Breann K. Garcia	Project Number J0808
Project Title Liquefaction: Soils in Motion. How Structures Respond to an Earthquake	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to understand liquefaction, the process that causes the soil to collapse and liquefy during an earthquake, and see which soils were more susceptible to this occurrence. My experiment was designed to see what would happen to the soils and structures during an earthquake. My goals were to find out which soils were strong on their own or could be combined with another soil to make it more stable during an earthquake and liquefaction event. The results could help define the type of soil to best build on to reduce earthquake and liquefaction damage.</p> <p>Methods/Materials In order to create an earthquake simulation, I built a shake table. Constructing the shake table consisted of these main components: wood, marbles, a glue gun, rubber bands, and closet handle casters. I also researched the four most common soils to build on, and acquired samples of each: pea-sized gravel, clay soil, sand, and loam. These soils were then divided into containers. A block of wood was used to represent a building and inserted into the soil. The tests were first performed without water. The container was shaken for three individual time periods; 30 seconds, 1 minute, and 3 minutes. The soils were then retested including water to simulate liquefaction. Using a protractor I measured the degree the building sank in the soil after each simulation. Observations were made on whether the block shifted, collapsed, sank, or did not move and also on how the soil responded to the shaking and liquefaction simulation; did the soil crack, liquefy, shift or stay intact.</p> <p>Results The results were that clay soil on its own or in combination with one of the three other soils responded the best in strength and stability and would possibly limit damage during a liquefaction occurrence.</p> <p>Conclusions/Discussion Liquefaction is devastating and more study needs to be done on how we can stabilize the soil, by either adding additives to the soil to react better during an earthquake or improving and increasing the speed of water absorption to limit liquefaction damage. There are real-life examples that show how structures reacted and failed during a liquefaction event. We need to learn from this when we rebuild, and either not rebuild there or make adjustments to the soil by adding a more stable soil to the mix.</p>	
Summary Statement My project investigates liquefaction and how earthquakes and their vibrations affect the stability of soils.	
Help Received My mom helped by driving me to get my supplies. She also drilled the holes for the nails and helped during the experiment with the stop watch. At the local home improvement store, a worker helped cut the wood and pvc pipe. A local construction company helped by donating the soils for the experiment.	