



CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

Name(s) Marie E. Jenkins	Project Number J0607
Project Title Factors that Affect the Transfer of Force through Saturated Soil	
Abstract Objectives/Goals The purpose of my project was to determine what effect additives have on the transfer of weight through saturated soil. The reason I performed this investigation was to try to establish if the effects of liquefaction can be prevented or lessened by adding elements to the soil. Methods/Materials I utilized a 3 foot long by 10 inch in diameter PVC pipe with four holes drilled into it vertically. I filled the pipe with soil (sandy loam) and different additives: bark, dried leaves, polymers, and styrofoam popcorn. I saturated the soil with water as I filled the pipe and inserted wooden dowels into the holes at the four various levels. Weights were added to the top. After waiting an hour for the soil to settle, I hit the pipe evenly around all surfaces to simulate the shaking of an earthquake. I then pulled the dowels out with a force measuring device and determined if the added elements helped to prevent compaction. Results The wet soil control with no additives resulted in the weights sinking 5 inches below the top edge of the pipe. None of the dowels could be removed because of the severe compaction. The bark additive trial resulted in the weights sinking 2 inches below the top. Only the bottom dowel could be removed. The dried leaves trial was similar to the bark trial. The styrofoam trial was slightly better in that the weights sank only 1 1/2 inches approximately, but still only the bottom dowel could be removed. The polymers proved to be most effective. The bottom 2 dowels could be removed, and the top weight sank only 1 inch below the edge of the pipe. Conclusions/Discussion It was clear from my experimental control results that water definitely made the soil unstable. The addition of the weights and the simulated earthquake shaking clearly demonstrated the effects of liquefaction when the weights sank down into the pipe. However, the additives did seem to lessen the effects of liquefaction. The polymers in particular helped to prevent soil compaction. My data suggests that the addition of polymer type materials to soil in earthquake-prone areas could lessen the devastating effects of liquefaction.	
Summary Statement The purpose of my project is to determine if the effects of liquefaction can be prevented or lessened by adding elements to saturated soil.	
Help Received Mother helped to type report and format graphs. Work colleagues of my mother helped to analyze soil types and prepare the PVC pipe.	