



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

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Project Title Earthquakes! Which Soil Mixtures Reduce Damage? A Second Year Study	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals When pressure builds along a fault the earth can slip and move fast causing an earthquake. People build their houses on different kinds of soils. I believe an experiment could be designed to see if small soil particles mixed with larger particles, in the soil, can reduce damage during an earthquake.</p> <p>Methods/Materials A construction company donated large pieces (1/4 and 1/8 inch rock) and sand. Equal amounts of controls, with large soil particles alone and then separately experimental groups, with half large mixed with half small (sand) particles, were put into a test box and lightly compacted with a wood block to a mark line. For each individual test 20 dominoes spaced the same, standing up and buried to a measured 1/4 inch were placed into the test soil. These dominoes were like the houses on the earth. A swinging hammer, was raised to the same height and let go hitting the box, and dominoes, to create the rapid movement of an earthquake. A count was then made to see how many dominoes fell over or leaned more than 45 degrees using a protractor. Three different controls, and then three experimental groups of the same large particle now mixed with sand were each repeatedly tested three times in this manner.</p> <p>Results Controls and experimental groups were math averaged. In experimental groups fewer dominoes fell out of 20, on average, in mixtures of large and small particles than the controls with large particles alone. The safest combination was 1/4 inch lava rock and sand. This mixture had an average of 7.4 less dominoes that fell than the control with 1/4 inch lava rock alone. In this test an average of 9 out of 20 fell with 1/4 inch lava rock alone while only an average 1.6 out of 20 dominoes fell when the same large particles were mixed with sand. So soils of mixed sizes may be safer, because fewer dominoes fell. This agrees with my objective, or hypothesis that mixtures might be safer.</p> <p>Conclusions/Discussion My test box and dominoes were just a model but there were differences. Because fewer dominoes fell that were on top of mixtures these soils may be safer in an earthquake. How can this happen? Well maybe the quick movement of the earth causes the small particles to fall in between the spaces of the large particles. This slows down the movement of energy that can destroy a house. Maybe now, people should try to build their houses on these kinds of soils or even mix large and small pieces then build on this safer start.</p>	
Summary Statement I studied if the kind of soil the house is built on may help or hurt the chances of it surviving an earthquake.	
Help Received Mother typing, brother graphs, father test box.	