



**CALIFORNIA STATE SCIENCE FAIR  
2016 PROJECT SUMMARY**

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<b>Project Title</b> <b>What's Shaking? The Truth about Liquefaction</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The object of my project is to determine whether a vertical or a horizontal direction of energy (simulating an earthquake) will cause more liquefaction to occur in saturated sandy soil? It is my hypothesis that horizontal energy will cause greater liquefaction to happen. <b>Methods/Materials</b> I placed a brick that represents an apartment building on top of a saturated sand filled container (eleven liters of sand, four liters of water, fourteen liter plastic container). I dropped a 6.8 kilogram dumbbell ten times from a height of 100 centimeters onto a wood pallet. These ten drops equaled one trial. I then recorded the measurement of liquefaction that occurred. I repeated this step for a total of ten times with the vertical drop. I did the same for the horizontal drop. I controlled the height of both drops by hanging a tennis ball 100 centimeters from the wood pallet. I constructed a device that would keep the brick from falling over by designing a metal screen to hold the brick upright. Both directional forces were powerful enough to create the phenomenon of liquefaction. <b>Results</b> My hypothesis was incorrect. This experiment revealed that the vertical energy caused more liquefaction to occur. The horizontal energy force caused an average of 1.92 centimeters of sinking. The vertical energy force caused an average of 3.63 centimeters of sinking. I was pleased that the variance was minimal: 0.5 centimeters for the horizontal drop and 0.7 centimeters for the vertical drop. This shows validity and reliability in the design of my experiment. <b>Conclusions/Discussion</b> Understanding liquefaction is important because many buildings in densely populated cities are built on sand that can liquefy. Better understanding of how to prevent liquefaction may lead to prevention solutions while saving lives and resources. Though surface waves (horizontal energy force) from earthquakes cause more structural damage my experiment shows that P waves (vertical energy force) cause more liquefaction to occur. When building structures in areas vulnerable to earthquakes and liquefaction it is important to consider ground and soil treatment as well as building structure design.	
<b>Summary Statement</b> My project explores whether vertical or horizontal energy will have a greater affect on liquefaction in saturated sandy soil.	
<b>Help Received</b> I designed and carried out this project by myself.	