CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
J0619

Project Title
Shake Down: The Effects of Liquefaction on Desert Soils

Abstract

Objectives/Goals
My objective was to test the strength and stiffness of the soil when exposed to vibratory, shock loading, such as explosives and earthquakes. Liquefaction is a condition when the soil momentarily liquefies and tends to behave as a dense liquid. Seismic waves cause ground vibrations that can cause liquefaction. I collected soils from the desert cities of San Bernardino County and Riverside County, testing the soil texture and the soil liquefaction percentage and the sink rate percentage.

Methods/Materials
A testing platform was built with saw horses and plywood, with a testing frame secured onto the plywood so that the testing container would not fall off the platform. A concrete vibrator was bolted down onto the plywood 32 centimeters away from the testing frame. Each liquefaction test consisted of placing 4 gallons, 15.137 liters of soil in a 5 gallon, 18.921 liter sterilite plastic container, measuring the level of dry soil in centimeters, then filling the container with water, letting it soak down to just under the top level of soil. Next the structure was placed on top of the soil. With a stop watch set for one minute the vibrations from the concrete vibrator began. At the end of one minute the depth in centimeters were measured on how far down the structure sank into the liquefied soil. Also the level of the liquified soil was measured on how far down the structure sank into the liquified soil. The soil from each desert city was tested three times.

Results
To the results were a study of 1)Testing the centimeters of the dry soil,
2)Testing the centimeters of the liquefied soil, 3)Testing the soil texture, percentage of sand, silt, clay. The soils with a high percentage of clay, Coachella, Salton Sea, Thermal had a high percentage of liquefaction and sink rate. Equally a soil that has a lower percentage of sand to silt and clay also liqufies at a greater rate. The soils that have a higher percentage of silt to sand and a small percentage of clay has lower percentage of liquefaction.

Conclusions/Discussion
Soil Liquefaction can be devastating to life and property and the more we learn about it by studying what happened in earthquakes past and testing soil reactions to vibrations,will help us build safer structures and minimize loss of life and destruction.

Summary Statement
Testing Soil Liquefaction and soil textures for Landers, Yucca Valley, Desert Hot Springs, Palm Springs, Palm Desert, La Quinta, Indio, Coachella, Thermal, Salton Sea, comparing liquefaction rate, with sink rate, with soil texture.

Help Received
Dad helped me build my testing platform and mom drove me to all the desert cities to collect the soil.