CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
J1811

Project Title
Earthquakes: Lifting, Shifting, and Retrofitting. Strengthening Structures for Seismic Activity

Abstract

Objectives/Goals
My objective was to subject buildings to a simulated earthquake on a shake table to understand three important factors which determine the amount of earthquake damage: (1) The strength and durability of the construction material used; (2) retrofitting of the building; and (3) the composition of the foundation soil and how liquefaction determines the amount of earthquake damage.

Methods/Materials
I conducted six experiments. The first three were pre-experiments and included tests as to: (1) - (3) Understanding seismic waves including Tsunami waves; testing the strength of different construction materials; and , Liquefaction in soil. The three main experiments included : (1) Testing towers made of three different materials on a shake table, (2) Testing retrofitted towers, and (3) Testing towers in different soils to study soil liquefaction. The tests used a point system to measure simulated injury and loss of life and earthquake damage.

Results
With my main experiments I observed that the metal tower had the best result with the least amount of earthquake damage. The wood had the second best result followed by the plastic tower. Second, when I added retrofitting to the towers all of the results improved with less damage and injury. Finally, the towers tested in loose soil had the most damage with the liquefaction test and damage increased as water content increased.

Conclusions/Discussion
The metal tower had the best result with the least amount of damage and injury because metal is a strong building material. Retrofitting can help save lives and minimize earthquake damage. I observed that when the soil is loose and wet it can cause more damage to buildings. Buildings should be built on stable soil with metal and wood and retrofitted in earthquake prone areas.

Summary Statement
An examination of the devastation of earthquakes and how to minimize damage, injury and loss of life as to three main factors: (1) the type of construction material, (2) retrofitting and strengthening of buildings, (3) and liquefaction of

Help Received
Mother and father provided some help in the layout. Father typed some portions of the report and helped build the shake table and towers.