CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
S0203

Project Title
Determing the Most Optimal Structure to Resist Specific Seismic Waves

Abstract

Objectives/Goals
The purpose was to determine which structural designs withstand secondary, primarily, and Rayleigh waves through the most applied force. Three structural designs were created and three waves were applied to each structral design; secondary, love, and Rayleigh.

Methods/Materials
We also looked into several articles and magazines featuring earthquake damage to cities located along fault lines. We then had to decide how to build a device that would simulate three earthquakes. This is referred to as a shaker table, in which we would pull or tilt the platform to simulate a specific wave. We built three different sets of buildings; Type 1 was with cross beams, Type 2 was with a base foundation, stilts, and cross beams, and Type 3 was with base foundation, stilts, diagonal cross beams, and single cross beams.

Results
The data indicates that the stronger the interior fortification and base foundation, the ability of the structure to resist a specific seismic wave was stronger than a structure with just cross beams (Type 1). In the general observation of building designs on compatibility in specified earthquake zones, Type 1 was highly responsive to complete collapse in comparison to the Type 3 building. Type 2 design was more able to withstand Raleigh waves, than primary or secondary, based on the strong foundation and stilts to balance the cross beams during the rolling motion. Type 3 responded to earthquakes the strongest as hypothesized. No complete collapse occurred in the primary, secondary, or Rayleigh wave. Type 3 buidling is the strongest in all three emitted waves, and thus is recommended to be constructed in all earthquake zones.

Conclusions/Discussion
The major issue that posed a threat to the validity of the exeriment was the use of the clay. The experiment was focused on structural design, and the dependency of clay to hold the strucures together, could have defeated the experiment's purpose by making the test results directly related to the durability of the clay. It is very difficult to work around this possible error,so the only way to resolving the situation, without abandoning the experiment's purpose would to concentrate more on historical events and statistics. We could investigate past earthquake and the seismic waves; then look into what main buildings were damaged and identify those structures.

Summary Statement
To determine the most optimal structure that can resist three specific seismic waves.

Help Received
Father helped to design the shaker table.