CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Lok Lei; Rebecca Orr

Project Number
J1816

Project Title
On Shaky Ground

Abstract

Objectives/Goals
The objective of this experiment was to find a good design for buildings in areas with high earthquake hazard levels. This project was designed to find how the placement of structural openings affects a building's stability during an earthquake.

Methods/Materials
A brief description of the experiment is as follows: six types of 15cm tall building and 20cm tall buildings were made according to the designs in the procedure. Each type was built five times and placed upon the shake table. The shake table was then turned on to ".5." A stopwatch was used to determine the time it took for each structure to completely fall. The time was measured and recorded in seconds.
To conduct his experiment, 1 stopwatch, 1 shake table, and 56 Jenga blocks were used.

Results
The project results showed that as the openings of a structure became more symmetrical, the time (sec.) it took for a building to fall increased. The building models with the openings placed closest to symmetry (Type 1, 15cm tall) took on average 1.848 seconds to fall, while the building with the least symmetrically placed openings (Type 6, 15 cm tall) took only an average of 1.198 seconds. In addition, height could not be proven to dramatically affect the results of the experiment.

Conclusions/Discussion
The hypothesis, that buildings with doors and windows that are placed symmetrically will withstand earthquakes better than others, was proven correct by the experiment conducted. The data collected supported the hypothesis because as the openings were more asymmetrical in a structure, the faster the models fell. However, a change in height did not significantly affect the results of the experiment.
This project expands knowledge of structural design and where to place doors and windows for buildings in areas with high earthquake hazard levels.

Summary Statement
This project experiments with the placement of structural openings and how it affects a building's stability during an earthquake.

Help Received
Mr. Lei explained the process of building a shake table to Lok. Dr. Orr provided transportation. Financial support for materials was provided by both the Orr and Lei families. Mr. Wing Chung participated in an interview.