CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J0218

Project Title
Will It Stand? What Specific Features Make a Structure Stronger?

Abstract

Objectives/Goals
My experiment was designed to test three different building structures to determine which commonly-used structure design would be the safest, sturdiest, and most stable. I tested these three designs against earthquakes and weights. Where I come from, earthquakes are common, and I found that some typical building designs used in the world today are not able to stand up to them!

Methods/Materials
The three buildings I used - Cube, Tall Building, and Crossbeam Building - were constructed out of uncooked spaghetti, held together at corners by 1/2 inch diameter balls. I designed and built my own Earthquake Simulator, which imitated the jolts and vibrations of earthquakes of different strengths. Using three examples of each type of building (nine structures all together), I figured out the strongest earthquake each structure could hold up to. Lastly, I used four AA batteries to test how musch weight each structure could hold.

Results
My hypothesis was that the Cube design would be the strongest, because it was small, compact, and sturdy. But as I tested each model, I found that the Tall Building was weakest, the Cube was only somewhat sturdy, and the Crossbeam Building stood up to everything without giving an inch! It stood up to the strongest earthquake and the full amount of batteries! The Tall Building, as I predicted, collapsed at the slightest earthquake and only a single battery.

Conclusions/Discussion
Though my hypothesis was wrong, I did learn why. The Cube's joints, like those of the Tall Building, were weak and unsupported. They were weakened by the weight of the beams, and had nothing to hold them up. The shaking of the earthquakes and the mass of the weights were too much for them, and they let the beams crack and wobble out of place. However, the Crossbeam Building had the strongest, most supported joints of the group, and was able to support its own weight when threatened by earthquakes and batteries.

Summary Statement
In my project, I tested three 'real-life', commonly used building structures in order to determine which was the most stable, testing them against an Earthquake Simulator that I designed and by figuring out how much wieght they could hold.

Help Received
Mother bought spaghetti; Father took me to the Home Depot, found the wood for the Earthquake Simulator, helped me cut it to the length I wanted, and showed me how to use the power drill; Sister helped collect rubber bands from newspapers