



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

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Project Title Building Better Earthquake Resistant Structures	
Abstract Objectives/Goals My objective in conducting this experiment was to test the effect of varied structural improvements on a building's performance during a simulated earthquake. My goal was to determine which building structural improvement provides the most earthquake resistance and stability. Methods/Materials My grandfather helped in building an earthquake simulator made from sheet metal and wood, attached to wooden rods and powered by a 7-amp, 120 volt electric drill. I overlapped four blocks of wood ten stories high to make a building, and placed them the center of the earthquake simulator. I left the simulator vibrating and timed until the building collapsed. Three (3) trials were done. At the end of each trial, the building was rebuilt. For the next set of three trials each, I modified and tested the building as follows: 1) adding a cross brace made of popsicle sticks, 2) adding a base isolator made of cardboard box filled with marbles, 3) adding steel rods placed at the top corners of the building, 4) then I tested a combination of cross brace and base isolator, 5) combined cross brace and steel rods, 6) combined steel rods and base isolator, and lastly, 7) combination of all 3, cross brace, base isolator and steel rods. I recorded the data of each trial. Results After conducting multiple tests on each building modification, the results of my experiment show that adding a combination of cross-bracing, base isolator and steel rods performed the best overall by resisting simulated earthquake conditions the longest, with an average standing time of 184 seconds. This combination resulted in an improved stability of 4,873% than my original control structure. Conclusions/Discussion Before I started this project, my hypothesis was that adding a combination of all three improvements, cross bracing, a base isolator, and steel rods to my control structure will be the most earthquake resistant. My experiment confirmed that my hypothesis was correct. The combined improvements prevented the building blocks from collapsing the longest than any of the other tested structures. The building with all three improvements was the most stable.	
Summary Statement I tested varied building structural modifications to determine which provides the most earthquake resistance, and my findings show that adding a combined cross bracing, base isolation and steel rods provides the best earthquake resistance.	
Help Received My grandfather helped in building the earthquake simulator. My parents helped with buying materials and preparing the board. My Science teacher helped in the overall consultation for this project.	