



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Quin Parker	Project Number J0319
Project Title Water Tower Shakedown! The Effect of Base Isolators on Linear Acceleration	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The US Geological Survey has charted that on average 3,600 earthquakes have occurred in the United States between the years 2000 and 2012. This creates a constant need for stronger and more earthquake-resistant structure designs. I decided to further investigate this need by studying the effects of base isolators in reducing the linear acceleration of a structure during an earthquake. My objective was to determine the most effective base isolator at reducing the average linear acceleration of a water tower during seismic activity.</p> <p>Methods/Materials A shake table was constructed, powered by a standard electric drill. A model water tower was constructed out of an Erector set. An iPad running the application, Sparkvue, was used to record the linear acceleration of the water tower when the shake table was running. There were four positions of the iPad around the shake table. Five base isolators (whiffle balls, golf balls, tennis balls, ball bearings, and felt sliders) were tested ten times for ten seconds each in all the positions. Average and maximum data points were recorded from each run to compare acceleration.</p> <p>Results The results showed that the tennis ball base isolators had an overall average of the averaged means of linear acceleration of 1.7506 m/s/s, which was the lowest out of the five base isolators. The remaining base isolators in order from the most to least effective were whiffle balls, golf balls, ball bearings, and then felt sliders.</p> <p>Conclusions/Discussion After studying base isolation technology, it seems that base isolators with the characteristics and features of a tennis ball would appear as the most beneficial solution to reducing linear acceleration during earthquakes. This proves that my hypothesis was correct. I think this knowledge will greatly help engineers and contractors create safer structures, such as water towers.</p>	
Summary Statement The project was conducted to determine the most effective base isolator at decreasing overall linear acceleration of a water tower during seismic activity.	
Help Received My father helped construct the shake table, buying supplies, and turning on and off the drill when data was being collected; my science teacher, Mr. Ennes, introduced the Sparkvue application to me; my mother helped type up the backboard material.	