



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> <b>Danielle C. Faulkner</b>	<b>Project Number</b> <b>J0310</b>
<b>Project Title</b> <b>Efficacy of Seismic Retrofits in Diminishing Surface Wave Induced Swaying</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My experiment investigated the effectiveness of the most commonly applied modifications to structures to reduce shaking, provoked by the compressing and expanding motion of P-waves, sustained during seismic activity. Base isolation, shear walls, and reinforced wall bursts were the models of retrofit I tested.</p> <p><b>Methods/Materials</b> I constructed four rudimentary two-story buildings using fiberboard and wooden dowels. To one I attached base isolating feet composed of fiberboard and cotton balls, to the second shear walls of fiberboard slats, and to the third building I affixed supplementary dowels acting as reinforced wall bursts. I built an electric shake table from a box within a larger box allowed to roll freely on styrofoam balls. A wire ran from the interior box to a multi-speed kitchen Stand mixer which acted as the motor, jerking it to and fro. With velcro, the structures were fixed to the shake table and a tank of colored water lined with white paper was fastened to their tops. As the buildings were subjected to three trials with foreshocks, a mainshock, and aftershocks, waves in the tank splashed, staining the paper. The heights of the tallest stains were measured, averaged, and compared to that of the control.</p> <p><b>Results</b> Compared to the control whose wave height exceeded 70mm, the base isolated structure decreased shaking by 38% with an average tallest wave height of 43 2/3mm, the reinforced wall burst decreased shaking by 53% its average tallest wave height being 33mm, and the shear wall structure reduced shaking by 56% with an average peak wave height of 33 1/3mm.</p> <p><b>Conclusions/Discussion</b> Shear walls proved most effective in reducing building sway, reinforced wall bursts following narrowly behind, while base isolators were least effective. However, when subjected to the more violent shaking of the simulated mainshock, base isolators visibly buffered more of the motion than the other retrofits.</p>	
<b>Summary Statement</b> Compare the effectiveness of seismic retrofits in reducing earthquake induced P-wave generated swaying.	
<b>Help Received</b> My father accompanied me to various stores for supplies, aided in cutting dowels, supervised trials, and provided encouragement.	