



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

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Project Title Green Concrete for Safer Infrastructure	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The rubberized concrete has superior damping performance for dissipating seismic energy and protecting structures. At the same time, instead of disposing the waste to a landfill, this technology will enable scrapped tires to be recycled with the best "green" practice. The objective is to experimentally investigate dynamic performance of rubberized concrete structures.</p> <p>Methods/Materials Methods: 1. Preparation of concrete specimens (3 normal and 3 rubberized specimens); 2. Free vibration tests (5 trials); 3. Seismic shaking tests (5 trials). Material for specimens: 10 kg of cement, 50 kg of sand, 15 kg of recycled rubber crumbs, 12 pieces of 5-mm diameter steel bars, 12 liter of water, 6 pieces of 27 in X 41 inch Styrofoam boards, 2 tubes of superglue. Material for experiments: 1 shaking table, 4 sets of nuts and bolts, 1 glue gun and 5 glue sticks, 2 seismographs, 1 personal computer, 1 digital camera.</p> <p>Results A free vibration test was carried out on each of the six concrete columns. The free vibration test was repeated 5 times for each of the six specimens. Meanwhile the damping ratio was calculated each time. The results show that the rubberized concrete columns have higher damping ratios than the normal concrete columns. This implies that the rubberized concrete columns are more capable in kinetic energy absorption. In the seismic shaking table tests, the concrete columns were tested in sequence on the shaking table at the selected seismic ground motion. Large movement of the column back and forth was observed. Popping sounds could also be heard. It was observed that cracks appeared in all the six columns, but relatively less cracks appeared in the rubberized columns.</p> <p>Conclusions/Discussion Based on the free vibration tests, the average damping ratio of rubberized concrete column is 7.7 while normal concrete columns is only 4.7. Adding rubber crumbs into concrete increases the damping ratio by 70%. The results of the seismic shaking table tests show that the peak response acceleration of the rubberized</p>	
Summary Statement This study demonstrates the potential for creating a "green" material # rubberized concrete, which possess the superior performance in absorbing kinetic energy during earthquake, protect large structures	
Help Received Mr. Yoshi Fukuda, research assistant at the Center for Advanced Monitoring and Damage Inspection, UC Irvine, provides helps in specimen and experiment preparation	