



CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

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Project Title An Investigation of the Potential Impact of Liquefaction-Induced Lateral Spreading on a Populated Urban Setting	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The main objectives of this project was to: a) clarify the existing definition of a "free face" in the currently vague and ambiguous lateral spread criteria and b) to provide a map of the City of Irvine with clear outlines of the specific areas that require attention to lateral spreading. In specific, the contours of equal lateral spread magnitudes will be established on both sides of the "free face" channel to highlight the potential extent of damage that may be associated with lateral spreading in an urban setting.</p> <p>Methods/Materials The model setup consisted of two main elements: the soil in its container, and a working shake table. A model slope was constructed with either bare earth, rip rap covering, concrete-paving, or a reinforced concrete retaining wall, and placed under seismic agitation to determine its lateral spread potential. The model was prepared by the filling of a soil box with the essential soil and carving out the slope based upon a contour drawn alongside the box. The entire box, along with the soil, was then set on a shake table and placed under a seismic force of about 0.25g. The movement of the box was captured with a camcorder and analyzed digitally. The map was created through usage of Youd's equation for calculating lateral spread displacement. The points generated from the equation was then used to plot the contour of lateral spread displacement on the Tustin Quadrangle seismic hazards map.</p> <p>Results The rip rap slope and the concrete lining slope displayed many characteristic damages associated with lateral spread, including the subsidence, or slumping, of the crown point and back edge, the heaving of the toe, the tension cracks, and extensive ground fissures. On the other hand, the retaining wall seemed to resist the forces of lateral spread, merely displaying some typical damages associated strictly with liquefaction: the "floating" on the liquefied soil and the loss of contact between the wall and the soil.</p> <p>Conclusions/Discussion In conclusion, the rip rap slope and the concrete lining slope should clearly be characterized as "free face" slopes, while a retaining wall should remain outside the category. This calls for the importance of new reinforced designs and the need to retrofit current slopes with further reinforcement.</p>	
Summary Statement This project clarified the existing definition of a "free face" in the currently vague and ambiguous lateral spread criteria and provides engineers with a map with clear outlines of the areas that require attention to lateral spreading.	
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