



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> Griffin M. Kraemer	<b>Project Number</b> <b>J0212</b>
<b>Project Title</b> <b>How Deep vs. How Steep: Experiment on Soil Stability of Steep Slopes for Building Foundations</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective was to determine the depth of a foundation required to maintain stability when a structure is built on a slope. The goal was to find out how deep a tower's foundation needs to be on a 30 degree slope.</p> <p><b>Methods/Materials</b> A model of a building was constructed on a slope using a rain gutter, bricks, potting soil, a tower of Lego building blocks and other items readily available. The building block tower used was 18 layers tall and the foundation was up to 5 layers deep at 30 degrees. This is very close to the same ratio as a 10-story building with a 3-story foundation.</p> <p><b>Results</b> After conducting the tests, the analysis showed that there was too much movement of the 18 layer tower with only a 5 layer foundation when built on a 30 degree slope.</p> <p><b>Conclusions/Discussion</b> A building must have strong foundation to stay standing and survive earthquakes, wind, rain and everyday use. One of the key factors in designing a foundation is the slope of the ground. This science experiment shows that a building's foundation must get deeper as the slope increases. The goal was to find out how deep a tower's foundation needs to be on a 30 degree slope. The results showed that the foundation must be greater than 30% of the exposed height.</p>	
<b>Summary Statement</b> This project tests a theory regarding soil stability and foundation depth when a structure is built on a steep slope.	
<b>Help Received</b> My father helped me build the experiment in our garage and helped with the spreadsheet for the analysis.	