



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

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| <b>Name(s)</b><br><b>Landon R. Creighton</b>  | <b>Project Number</b><br><b>J0399</b> |
| <b>Project Title</b><br><b>Does Doubling the Amount of Cement in Concrete Improve Torque Resistance?</b>  |                                       |
| <b>Objectives/Goals</b><br>To test the torque resistance of concrete mixes when the ratio of cement is changed. I will change the ratio of cement to the sand and gravel. I will start with a normal one part cement to two parts sand and three part gravel. The next test will have one and a half parts cement and the same sand and gravel ratio. The third test will have two parts cement to the same sand and gravel ratio. This will help anybody using concrete in a place where it could be twisted.  |                                       |
| <b>Abstract</b><br>I built wood forms to make three sets of 12 # 1.5# x 1.5#x 12# samples for a total of 36 samples. I mix each batch of concrete and poured them into the forms for the batch. The concrete cured for 14 days. I marked the samples and removed the forms. With my dad's help I made a machine that would twist the sample. Each side of the sample would be clamped into the machine with one side ridged and the other on a bearing. An arm was welded to the bearing side clamp then I hung a bucket near the end of the arm. For weight, gravel was slowly poured into the bucket. When the sample broke the amount of gravel was weighed and recorded.          |                                       |
| <b>Methods/Materials</b><br>I built wood forms to make three sets of 12 # 1.5# x 1.5#x 12# samples for a total of 36 samples. I mix each batch of concrete and poured them into the forms for the batch. The concrete cured for 14 days. I marked the samples and removed the forms. With my dad's help I made a machine that would twist the sample. Each side of the sample would be clamped into the machine with one side ridged and the other on a bearing. An arm was welded to the bearing side clamp then I hung a bucket near the end of the arm. For weight, gravel was slowly poured into the bucket. When the sample broke the amount of gravel was weighed and recorded. |                                       |
| <b>Results</b><br>My data shows the concrete mix with the greatest amount of concrete has the most torque resistance. Here are the average weight loads of the concrete samples I tested. Each of the concrete mixtures were tested with 12 samples. Ratios are displayed with cement first, sand second, and gravel third.<br><br>Mix 1 # 1:2:3 ratio      Average 4.29 lbs.<br>Mix 2 # 1.5:2:3 ratio    Average 7.96 lbs.<br>Mix 3 # 2:2:3 ratio      Average 9.38 lbs.   |                                       |
| <b>Conclusions/Discussion</b><br>The higher ratio of cement greatly increased the resistance to torque. Increasing the cement contents by another 50% almost doubled the resistance to torque.  |                                       |
| <b>Summary Statement</b><br>This project proves that doubling the cement in concrete increased the torque resistance of a concrete sample.  |                                       |
| <b>Help Received</b><br>I would like to thank my dad for building the machine I used for breaking samples in my project. I also thank my sister Audrey for proofreading my project and helping me with my board. I would also like to thank my mom for getting me science library books and typing my project.  |                                       |