



CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

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| Name(s) Dakota J. Niemann | Project Number J0316 |
| Project Title Aggregate Size vs. Concrete Strength | |
| <p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective is to determine whether aggregate size for granite rock impact the compressive strength of concrete. My hypothesis is that it does and presumed ranking based on background research is that rock (diameter: 25.4 # 37.5 mm) would be greatest, followed by pea gravel (diameter: 9.5 mm to 12.7mm), then sand (diameter 4.75 mm) and finally the control sample comprised of water and cement.</p> <p>Methods/Materials Using screens, granite aggregates based on size were separated # manipulated variables being: sand (sample 2), 3/8 to 1/2 inch rock (sample 3), 1 # 1 1/2 inch rock (sample 4). The samples were then mixed with an equivalent ratio of water and cement and poured into cylindrical molds. These molds were then stored in a vault in accordance with ASTM testing procedures and breaks conducted on the 7th, 14th and 28th day to determine compressive strength # the responding variable.</p> <p>Results At the 7th, 14th and 28th day break, the compressive strength for the samples was as follows: cement (control sample) - 351 kPa, 28,366 kPa, and 23,338 kPa; sand - 10,300 kPa, 10,938 kPa, and 10,598 kPa; pea gravel # 1,127 kPa, 19,386 kPa, and 27,289 kPa; rock # 23,660 kPa, 26,855 kPa and 29,599 kPa respectively.</p> <p>Conclusions/Discussion Based on data collected, the hypothesis, which stated concrete possessing the larger aggregate would be able to withstand more pressure, was supported. Overall, concrete with the larger aggregates exhibited greater compressive strength than that of concrete with smaller aggregates. This is due to large aggregates being able to interlock within the mixture, providing strength based on its and the cement internal properties. It should be noted that plain cement possessed more strength than concrete with sand. This is probable due to the sand not managing to dehydrate properly, and/or poor mixing, and the development of sand lenses.</p> | |
| Summary Statement Does the size of aggregates for granite rock impact the strength of concrete? | |
| Help Received I would like to thank: my dad who supervised the mixing of the concrete; Francisco Alonso and his staff at the Orange County Materials Lab for help and use of lab equipment, storing of concrete cylinders, and testing, and my science teacher, Mrs. Galassetti, who helped me with the report. | |