



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Kelton K. Garber	Project Number J0311
Project Title Alternatives to Sand in Concrete	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this engineering model is to discover a reasonable alternative for sand in concrete. One of the central ingredients for engineering is sand, and it is becoming increasingly difficult to obtain. The issue of limited supplies of usable sand affects me personally as concrete is a major building material for places like my home and school.</p> <p>Methods/Materials The engineering model comprises of several concrete bricks, made and tested the exact same way. However, each has one different ingredient. The independent variable in each concrete brick is the usage of sand, rice, plastic, or dried beans. The sand made concrete brick is the control variable, which is used to compare the other bricks. The best brick is determined by durability (dependent variable) in multiple scenarios (compression, temperature, and submersion).</p> <p>Results The dried bean brick was affected the most by water, was the weakest when lifted up wet, and was the only brick to crumble. The sand brick dried slowly, and the rice brick absorbed the most hot water. Plastic proved to be the best suitable alternative for sand as it handled all of the temperature, compression, and submersion tests with minimal changes to size, weight, and durability.</p> <p>Conclusions/Discussion This project tested a variety of concrete bricks, made with rice, plastic, dried beans, and sand (the control variable). During the tests, there were a few uncertainties which could have had a major effect. The cold weather had an effect on the duration for the bricks to dry during their construction. The first attempt had the bricks originally dry for five days, but the temperature and location made them take eight to ten days instead. The sand brick and dried bean bricks were unable to hold their shape after drying for ten days, and both had many cracks. More cement was added in order to stabilize these two bricks. After all of the tests, the results show that the hypothesis is correct. The plastic brick held its shape the best, handled warm, cold, and wet climates with little to no damage, also withstanding the weight of an adult (195 lbs).</p>	
Summary Statement After testing multiple substances, under varying conditions (temperature, pressure, and submersion), plastic proved the best alternative to sand as it handled all the tests with minimal changes to size, weight, and durability.	
Help Received My mother and father helped me design my project along with my brother and sister who helped me execute the testing.	