CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
J1817

Project Title
Concrete Reinforcements

Abstract

Objectives/Goals
My objectives are to determine how much stronger does reinforcement make concrete, and which types of reinforcement makes concrete stiffer compared to other types.

Methods/Materials
The materials I used for this project are; (2) 50 pounds bags of concrete mix, (2) 3/8-inch diameter wood sticks as a type of reinforcement, (2) 3/8-inch diameter steel bars as a type of reinforcement, (1) one pound bag of 1-inch long fiberglass material as a type of reinforcement, (5) 2-inch diameter by 60-inch long PVC tube to hold the concrete in, a mixer to mix the concrete, (2) 5-gallon buckets to hold sand that I used for weight, a dial indicator instrument to measure the bending to 1/1000th of an inch displacement.

Results
The PVC tube with no concrete took 72.4 pounds to bend 0.964 inches. This is 75 pounds per inch stiffness.
The PVC tube with concrete only took 87.2 pounds to bend 0.915 inches. This is 95 pounds per inch stiffness.
The PVC tube with concrete and wood took 103.8 pounds to bend 0.970 inches. This is 107 pounds per inch stiffness.
The PVC tube with concrete and fibers could not be tested because my Dad sawed open this tube by accident, instead of the spare concrete only tube.

Conclusions/Discussion
The steel reinforcement was the strongest and the stiffest. The PVC tube only was the weakest. The concrete with wood was the second strongest, and the concrete only tube was the second weakest. This means that the stronger the reinforcement, the stronger the tube was.
I also discovered that as you add weight to the tubes with concrete in them, the stiffness goes down as the weight goes up. This must mean that the concrete inside the tube is breaking. The PVC tube alone was about the same stiffness for all the wieghts.
I found out that the total stiffness of a tube is equal to the PVC tube stiffness plus the stiffness of the concrete and reinforcements inside of the tube.

Summary Statement
This project helps to determine the strength of concrete with different types of reinforcement

Help Received
My dad bought the materials and showed me to mix concrete and help me make the graphs