CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S1512

Project Title
The Impact of Construction Materials on the Attenuation of Sound

Abstract

Objectives/Goals
My project is to determine which construction material will result in the most sound reduction at various sound levels. My hypothesis is that the 2" brick will outperform the other materials because it is the thickest.

Methods/Materials
A sound source (speakers) is placed at one end of a six-foot cardboard sound chamber emitting white noise, and the sound level meter is placed on the other end of the chamber. The sound chamber is split in two parts for the insertion of the sound reduction material. These one-foot by one-foot materials include: mirror, acoustic tile, Styrofoam insulation, 2" concrete brick, 1 3/4" concrete brick, 1½" clay brick, and wood that has widths of 3mm, 6mm, 9mm, and 12mm. The sound source is set to 70 dBA (normal road noise), 85 dBA (hazardous working environment), and 90 dBA. The different construction materials are tested in two different positions for ten readings in each position. This totals 660 readings.

Results
At the 70 dBA level, the acoustic tile absorbed an average of 11.54 dBA and had the greatest sound reduction. In comparison to the 3mm wood, which absorbed an average of 4.62 dBA and had the least sound reduction, the acoustic tile performed almost 7 dBA better. The 2" cement brick averaged 10.25 dBA and the 1½" clay brick averaged 10.08 dBA. The mirror averaged 5.68 dBA and the insulation averaged 7.57 dBA. The acoustic tile did the best, followed by the three bricks, and then the insulation. These averages remained proportional at both the 85 and 90 dBA levels.

Conclusions/Discussion
My hypothesis was not supported by the data. The acoustic tile performed the best because of the structure and composition of the materials that compose it. The wood did the poorest because the thin widths provide minimal sound reduction. Although the brick did not outperform the acoustic tile, the results were very close. This makes concrete ideal for the building material of highway sound barriers because it is cost effective, easy to assemble, and stable in various weather conditions. These results and observations have drawn my interest to new ideas of a combination of materials. Would there be greater sound reduction if acoustic tile was placed in concrete barriers along highways? Are two layers of acoustic tile twice as effective than one? These are some of the questions that I would further test.

Summary Statement
My project was to determine the effects of various construction materials on the attenuation of sound.

Help Received
Mother obtained necessary equipment.