CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J1204

Project Title
The Effect of Various Combined Thicknesses of Glass on Sound Transmission

Abstract

Objectives/Goals
My experiment tested the transmission of sound through glass. My objective was to determine what thicknesses of double-pane glass would reduce the most sound.

Methods/Materials
I built a sound proof box out of concrete block which was closed on all but one side to direct the sound. On the one open side I pipe-clamped various thickneses of glass in wooden frames. The sound source was a computer speaker inside the concrete box. I then broadcast computer generated test sounds at different frequencies at a constant volume for a duration of 10 seconds. Six frequencies and 3 double-pane glass combinations were tested. A Sound Level Meter (SLM) was used to take sound measurements in decibels. Over 100 samples were taken in the same location at the same time of day.

Results
My experiment showed a pattern in sound reduction by all combinations of glass tested as sound frequencies were increased between 400 Hz and 3150 Hz. However, the lowest frequency tested, 250 Hz, did not conform to this trend. Interestingly, the smallest oveall thickness of combined glass (1/4"& 1/16")reduced the most sound at the highest sound frequency of all glass combination tested, but reduced the least amount of sound at the lowest frequency. Conversely, the greatest overall thickness of combined glass (1/4" & 1/4") reduced the moste sound at the lowest sound frequency, but the least at the highest frequency.

Conclusions/Discussion
These results are significant since they show that different combinations of glass thickness that make up a single piece of double-pane glass can be more effecive in reducing sound depending on the type of sound wave transmitted through the glass. As far as the 250 Hz frequency mentioned in the "Results" section above not conforming to the testing pattern, this could have been because of the size of my sound box and the position of the SLM relative to the speaker. A 250 Hz wave is about 4 feet long so the box should probably have been longer and the SLM further from the sound source to accurately measure this sound frequency.

Summary Statement
My experiment is about how different combined thicknesses of glass affect sound transmission.

Help Received
Dad provided guidance on building the sound box; Mom helped type; Dr. Segal provided acoustical advice. Dr. Wilson lent me the Sound Level Meter.