CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J1230

Project Title
It's Getting Cold

Abstract

Objectives/Goals

The purpose of this project was to determine whether cloth, paper or sand were the superior heat insulator for conductive heat. A testing chamber was designed to simulate a housing unit, with exterior and interior walls separated by the insulation material. To build the testing chamber, ## inch thick plywood planks were measured, cut and nailed together to create the inner and outside boxes, and the outer box lid. The access hole for the thermometer was then located and drilled through the outer box lid. Wood stud supports for the inner box and the Pyrex beaker were measured and cut. The inner box was placed in the middle of the outside box, creating the space in which the chosen insulation materials were positioned. Once the paper, cloth or sand had been placed inside this space, the beaker was filled with 500ml. of water heated to 210 degrees Fahrenheit and stationed on a small support inside of the inner box. The outer box lid was placed on the top with the access hole plugged. The box was placed inside of the refrigerator (to mimic exposure to inclement weather). Temperature was checked and recorded every hour during the four-hour testing period.

The final results showed that cloth was the overall superior heat insulator, followed by closely by paper. While at the end of the testing period both the cloth and the paper retained 96 degrees Fahrenheit, cloth retained more heat than paper during the interval hours. Sand, however, retained only 87 degrees Fahrenheit at the testing end, and at every interval measurement.

Discovering that sand was the least effective insulator was surprising. Because the sand covered more space between the two boxes than the other materials tested, it should have had greater heat conductivity. However, this result can be explained because sand is more porous than the paper or cloth, and therefore is the most susceptible to thermal bridging. The testing results regarding paper were surprising because the cloth towels were a higher density material; however, the closeness in the testing results between cloth and paper can be explained because there was a greater volume of paper material that could be placed in the testing chamber than the cloth towels.

Summary Statement

Testing the heat retaining capabilities of paper, sand, and cloth as insulation.

Help Received

Dad helped construct the box