CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
J1314

Project Title
Heat It Up! Insulators in the Building Industry

Abstract

Objectives/Goals
The purpose of this project was to learn how insulation works and to determine which type of insulation performs best in a building environment.

Methods/Materials
I built three boxes with each type of insulation(all with 1 in. thick walls: foam board, pine wood, and drywall.I built a fourth box to use as a CONTROL which is made of thin, 1/16 inch hard cardboard.I drilled a large hole into each box to insert the soldering iron, and sealed around the soldering iron with caulking.I drilled a hole in each lid where the thermometer was placed.I tested the set of four boxes 20 times. The thermometers were the same brand, and likewise with the soldering irons. Each time, I started my test by turning on the soldering irons simultaneously. The soldering irons provided a good heat source to mimic a space heater and heated the air quickly. Every ten minutes, I recorded the temperature of each box. At one hour, I ended my test and recorded the final temperature of each box.

Results
The foam board insulated better than all others from the beginning of testing, with the greatest difference in temperature being observed after about 30 minutes over the course of 20 tests. From 30 minutes to 60 minutes, the foam board consistently maintained a higher temperature of at least 25 degrees Fahrenheit. Standard Deviation of the final temperature of the 20 tests was calculated for each material: 1.9, 1.8, 2.8, and 4.8 degrees Fahrenheit for Cardboard, Drywall, Wood, and Foam board, respectively. I also ran some tests to determine the maximum temperature each box could reach after seven hours. The maximum temperatures reached for each box were 105, 110, 120, and 470 degrees Fahrenheit for Cardboard, Drywall, Wood, and Foam board, respectively.

Conclusions/Discussion
I chose the foam board because the foam consists of many small air pockets, which acts as an excellent form of insulation, inhibiting heat transfer through conduction. The final results clearly proved that the foam board box far outperformed the other boxes by more than 20 degrees Fahrenheit. In descending order, the other three materials performed in the following order: wood, drywall, and cardboard (Control). If I were to expand on this project, I would want to test different types of foam insulation because the foam performed really well in the tests. I could experiment with foam board, foam rolls, loose fill foam, and others.

Summary Statement
My project determined that among common building materials, foam board insulates best.

Help Received
I received guidance from Mr. Paul Pakus, my parents, and Zach Beavis. My father also assisted with construction of the boxes by cutting the box materials.