CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
J1322

Project Title
Reflect the Heat

Abstract

Objectives/Goals
My hypothesis is that a radiant barrier will work more efficiently with a larger air space between it and the heat source.

Methods/Materials
I made an apparatus (a 12"x12"x24" insulated plywood box) by using plywood, 1x2 pine, and polystyrene for insulation. A fifteen watt light bulb was used as a heat source at one end of the apparatus. The inside of the apparatus was divided in half by 12"x12" roof panels made of 1x4 framing, 1/2" OSB sheeting, 15 lb. building paper, and asphault shingles. Four different roof panels were made that had a radiant barrier (heavy alminum foil) mounted in different positions. One was mounted on the shingles facing the heat source, one on the sheeting facing away, one on the rafters facing the heat source, and one was a control that didn't have a radiant barrier. I tested each roof panel in the apparatus measuring the temperature on both sides with digital thermometers every five minutes for two hours. I tested each panel three times each and averaged the three outcomes. I used the largest temperature differential on each panel tested to determine the performance of the radiant barrier.

Results
The control had an average temperature differential of 15.8° C (28.4° F) at 120 minutes. It had the lowest performance of all the tests. The shingle mounted radiant barrier had a temperature differential of 23.2° C (41.8° F) at 120 minutes. This was the highest temperature differential. The other radiant barrier positions performed within these two outcomes.

Conclusions/Discussion
After completing my investigation, I found that my hypothesis was correct. My hypothesis stated that a radiant barrier will work more efficiently with a larger air space between it and the heat source. My investigation showed that a radiant barrier in that position (mounted on the roof shingles facing up) had the greatest effect against radiant heat. Second place goes to the rafter mounted radiant barrier (4" air space facing heat source). The sheeting mounted radiant barrier came in third. This placement had a larger air space (the attic), but that air space was not between the barrier and the source. It was on the other side. In contrast, the control (standard roof with no radiant barrier) performed the worst.

Summary Statement
I am testing if radiant barriers work better with a larger air space between them and the heat source.

Help Received
Dad: Construction Help, Mom: Board Assembly Help, Grandpa: Material and Supplies, Teacher: Project Advisement.