CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
J2120

Project Title
Energy Efficiency of Differentiated Roofing Materials

Abstract

Objectives/Goals
The objective of this project was to determine the efficiency of different roofing materials, including a composite shingle roof, a wood shake shingle roof, and a living roof, to maintain moderate internal temperatures and humidity in varying seasonal weather.

Methods/Materials
4 pieces of Plywood, fasteners, thermometers, humidity gauges, roofing materials: wood shake, composite shingle, and construct a living roof of sod and weeds.
Build 4 plywood doghouses with 3 different roofs and leave one bare for a control. Measure the temperature and humidity inside each doghouse and outside. Evaluate the efficiency of each roof by calculating the deviation from the outside temperature and humidity. Observe from June through February to assess efficiency in a variety of weather conditions.

Results
In hot months, the living roof maintained cooler temperatures than wood shake or composite shingle roofs. The wood shake shingle maintained a cooler internal temperature than the composite shingle roof. The humidity with the living roof was consistently but not significantly higher in the summer than wood shake shingle. Composite shingle held significantly higher temperatures in the summer.
In the cooler months, the deviation in temperature and humidity was insignificant between all roof types and did not support that one roofing material was measurably more energy efficient than another.

Conclusions/Discussion
A possibility for why all roof types had little effect on internal temperatures in the winter could be due to the sun's angle in the sky, or the smaller difference between daytime and nighttime temperatures during the winter than during the summer. While the living roof did maintain cooler temperatures in the hot summer months, the humidity within the doghouse was measurably, but not significantly higher than the wood shake shingle house. This indicates that both a wood shake shingle roof and a living roof better maintain moderate internal temperatures and humidity. The living roof provides a number of environmental benefits that the wood shake and composite shingle roofs do not. The living roof provides habitat for insects and small birds, supports honey bees, aids in combating carbon dioxide emissions, and can potentially prevent hot spots in big cities. Furthermore, a living roof can be used to grow shallow root food, especially in urban areas where space is limited.

Summary Statement
Through observing doghouses with a wood shake shingle roof, a living roof, and a composite shingle roof, I determined that living roofs and wood shake shingle roofs are more energy efficient in the summer than composite shingle roofs.

Help Received
With adult supervision, I used a free, online blueprint to construct all four doghouses. My science teacher helped me to determine how to break down my data into manageable sets.