

ABSTRACT

WHAT IS THE BEST WAY TO IMPROVE THE RADIANT AND CONVECTION INSULATION IN THE CURRENT FIRE SHELTERS USED BY WILDLAND FIREFIGHTERS?

OBJECTIVE/GOALS:

The objective of my project is to develop a shelter that will address both the radiant and convection heat that is generated in wildfires. My goal is that this improved fire shelter will save the lives of wildland firefighters.

METHODS AND MATERIALS:

For my experiment, I built small scale fire shelters to replicate the actual fire shelters. I placed an egg in each shelter because an egg is made of protein and changes structure when exposed to heat. Then, I used different combinations of reflective shields and sodium polyacrylate and placed them in a 550 degree oven. After thirty minutes, I examined the egg to see the effects. My independent variable was the different elements: aluminum foil, sodium polyacrylate, air gap, and U.S. Forestry fire shelter. My dependent variable was the amount of heat that was reflected and amount of heat that passed through. My controlled variables (constants) included: standard oven, 550 degree Fahrenheit heat, propane torch, raw eggs, the measurement tools (laser digital thermometer and Oneida digital internal thermometer), construction materials, time in the oven and time exposed to open flame.

RESULTS:

The best fire shelters need a combination of three elements. After thirty minutes, the fire shelter that withstood the heat best was the hydrated polyacrylate fire shelter with a reflective shield and an air gap. There was only an increase of 11 degrees inside the fire shelter after thirty minutes.

CONCLUSIONS:

In conclusion, I learned the best fire shelter had to have a combination of a reflective shield, a hydrated polyacrylate insulator, and an air gap. This performed better than the hydrated polyacrylate with no reflective shield, the dry polyacrylate with a reflective shield, or the standard issued Department of United States Forestry fire shelter. I also learned that it is essential to have an air gap in the shelter otherwise convective heat will come in contact with the firefighter thus killing him/her. I proved my hypothesis that a combination of hydrated sodium polyacrylate, reflective barrier, along with air gap, is the best way to improve the insulation.