

Exercise 17 The Effectiveness of Insulation

Objectives

1. Test the insulating effectiveness of various kinds of materials.
2. Compare results with published R -values for different materials.

Safety considerations: The light bulb in the box will become hot. The apparatus should not be left unattended, or it may overheat. Check the electrical connections before turning on the bulb.

Introduction

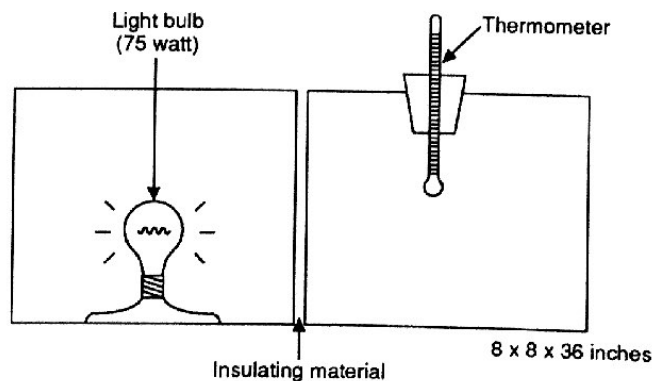
One of the most economical ways to reduce heat loss or gain in buildings is by using appropriate insulation in construction. It is also possible to install insulation in already constructed buildings to reduce heat loss or gain. Most insulating materials are rated as to their insulating value. The standard unit is called an R -value. It is a material's ability to resist the flow of heat through it. The higher the R -value the better the insulating ability. The reciprocal of R ($1/R$) is a measure of the amount of heat energy in British Thermal Units (BTU) that would pass through a piece of material 1 square foot in area in 1 hour when the temperature is 1° Fahrenheit higher on one side of the insulation than on the other. A BTU is the amount of heat energy necessary to raise 1 pound of water 1° F and is equal to 252 calories. The following table lists typical R -values for several kinds of materials.

Materials	R -value
No insulation	0
Single-pane glass	0.9
Double-pane glass	1.85
Triple-pane glass	2.8
1-inch wood	1-1.5
1-inch Fiberglass batts	3.1-3.7
1-inch styrofoam	5.5

Procedures

Use the apparatus provided to test the insulating ability of several materials in the following way.

1. Insert thermometer in the end of the apparatus.
2. Place insulating material in the middle of the apparatus (see diagram).
3. Close the lid.
4. Turn on the light bulb.
5. Record the change in temperature every five minutes for thirty minutes.
6. Graph the data.

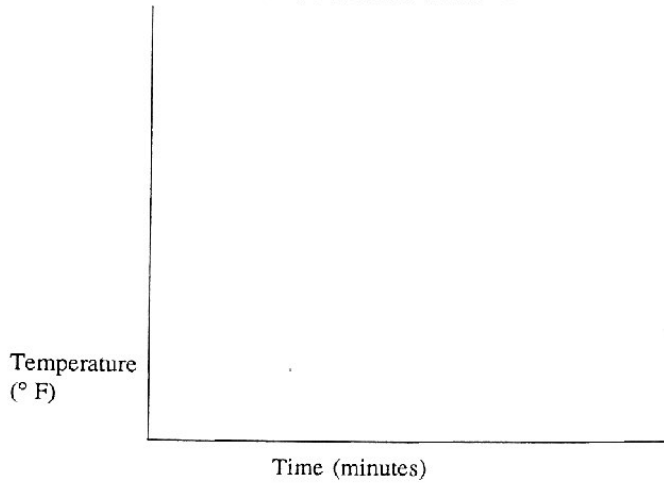


Your instructor will probably divide the class into groups, with each group responsible for testing one or two different materials. In order to have a basis for comparison, at least one trial should be run with no insulating material in the apparatus. The other materials may be assigned by the instructor. Record all the data on the graph on the data sheet.

Name _____

Section _____

The Effectiveness of Insulation Data Sheet



1. Which of the materials was the most effective insulation?
2. If you needed to choose an insulation that was thin, which would you choose?
3. Are your results consistent with published *R*-values?