

A costly escape

Knowledge of how heat moves from a warm place to a cooler place can help you to save on the energy that is used to heat and cool your home.

Using less energy for heating and cooling also conserves valuable resources such as coal and natural gas that are used to generate electricity.

Staying warm

In winter, heat leaves the inside of a warm, cosy home by conduction, convection and radiation. New homes are designed to reduce heat losses by all three methods. However, there are also measures that occupants can take to reduce heat losses (and the bills that go with them).

Using the sun

The direction that a house faces, positioning of windows and skylights, and the types of trees planted around the house all affect the amount of sunlight and radiated heat that enter a home. **Deciduous** trees planted near north-facing windows allow radiated

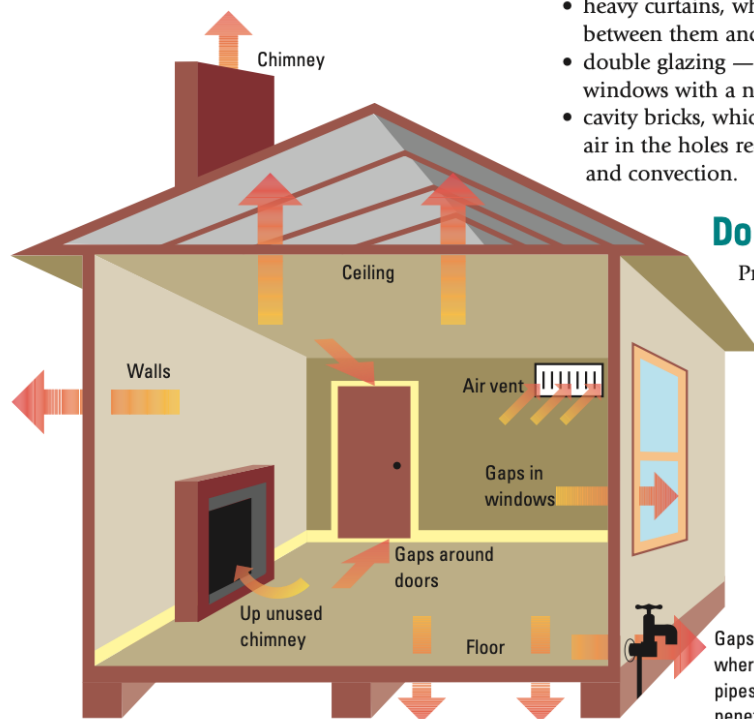
heat from the sun through in winter but block it out in summer.

Insulation

Heat loss by conduction occurs through the ceiling, walls, windows and floor. Since air is a very poor conductor of heat, materials containing air reduce heat loss. However, if the air is free to circulate, it can move away, taking heat with it. The best insulators, therefore, are those that contain air that is restricted from moving. Woollen clothes, birds' feathers and animal fur are all good insulators because they restrict heat loss by both conduction and convection.

Some ways in which insulation is used in the home include:

- ceiling insulation such as fibreglass batts and loose rockwool that can be blown in. These materials contain pockets of air that provide insulation, and reduce the loss of warm air from the roof by convection.
- cavity wall insulation, a foam that can be sprayed in between the inside and outside walls
- heavy curtains, which trap a still layer of air between them and windows
- double glazing — the use of two sheets of glass in windows with a narrow gap of air between them
- cavity bricks, which have holes in them. The still air in the holes reduces heat loss by conduction and convection.



Do you feel a draught?

Preventing draughts is the easiest way to reduce heat loss in winter.

There are many products available from hardware stores designed to seal small cracks and gaps to stop draughts. Draughts from chimneys and exhaust fans are difficult to control, but some exhaust fans have automatic shutters that close when the fan is not in use. Chimneys may have a metal plate to seal off air when there is no fire alight.

Heat can escape from many different places.

UNDERSTANDING AND INQUIRING

REMEMBER

- 1 What property makes a material a good insulator?
- 2 Installing insulation in the ceiling reduces which method (or methods) of heat transfer?
- 3 What is the cheapest way of reducing heat losses from your home in cold weather?

THINK

- 4 Foil placed in ceilings and walls is often referred to as 'insulation'. Is this term appropriate? Explain your answer.
- 5 What are convection currents? Draw a diagram to show how they move heat around a room.
- 6 Homes with central heating that are built on concrete slabs have heating ducts in the ceiling because they cannot be installed in the floor.
 - (a) What is the disadvantage in having ducts in the ceiling?
 - (b) Suggest a way of overcoming this disadvantage.
- 7 Loose clothing is recommended on hot days as it allows body heat to escape. Explain why loose clothing is better than close-fitting clothing for this purpose.

INVESTIGATE

- 8 What features of a thermos flask reduce heat loss by:
 - (a) conduction
 - (b) convection
 - (c) radiation?