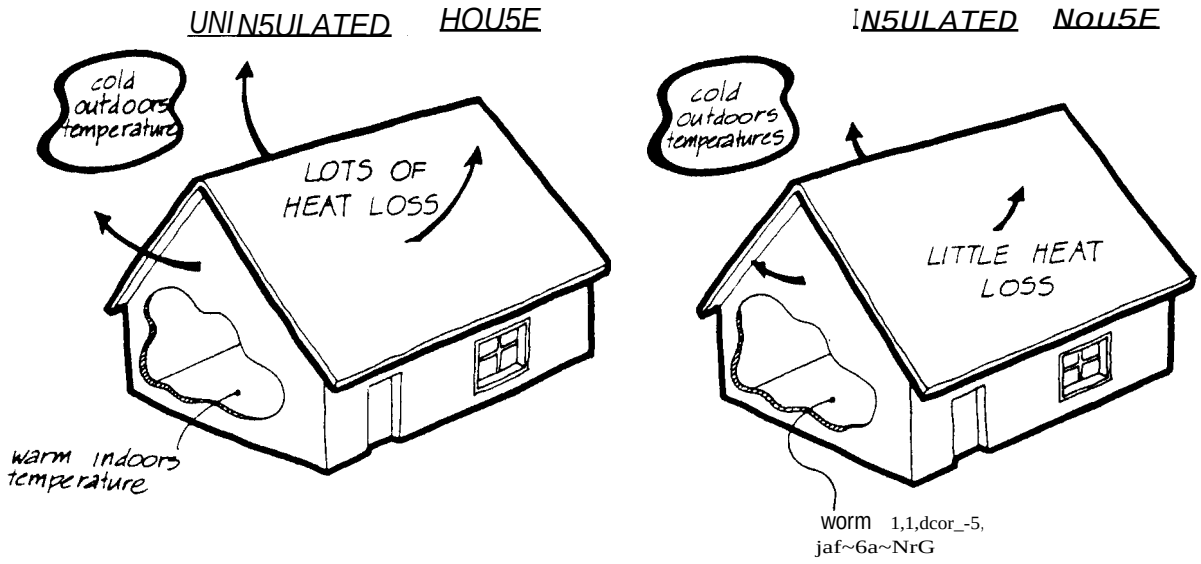
HOUSE HEAT LOSSES 8

Houses lose their heat because it's hotter inside than outside. How exactly is the heat lost? Mostly it is lost in three ways: heat leaking by conduction through the walls and roof; heat leaking by radiation and convection through windows; and heat leaking by transport through cracks in windows and doors.

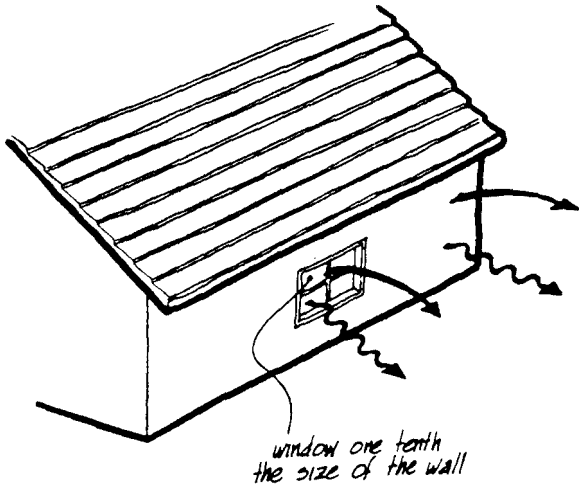
Conduction losses through walls and roofs usually account for about half of the total heat loss in an uninsulated house. But if fiberglass batting or plastic foam is used to insulate the walls and thick fiberglass batting insulates the roof, the conduction losses can easily be cut in half. The thicker the insulation is, the less heat is lost by conduction. A roof with three inches of fiberglass insulation will lose twice as much heat as a roof with six inches of insulation.



Uninsulated House Loses More Heat

The next most important heat loss is through windows. Even though ordinarily very little surface area of a house is made up of windows, heat losses through windows can amount to as much as the heat loss through an insulated wall. If a well-insulated wall of your house is one-tenth glass, as much heat can be lost by conduction through the wall as through windows-even though the wall has a ten times larger area.

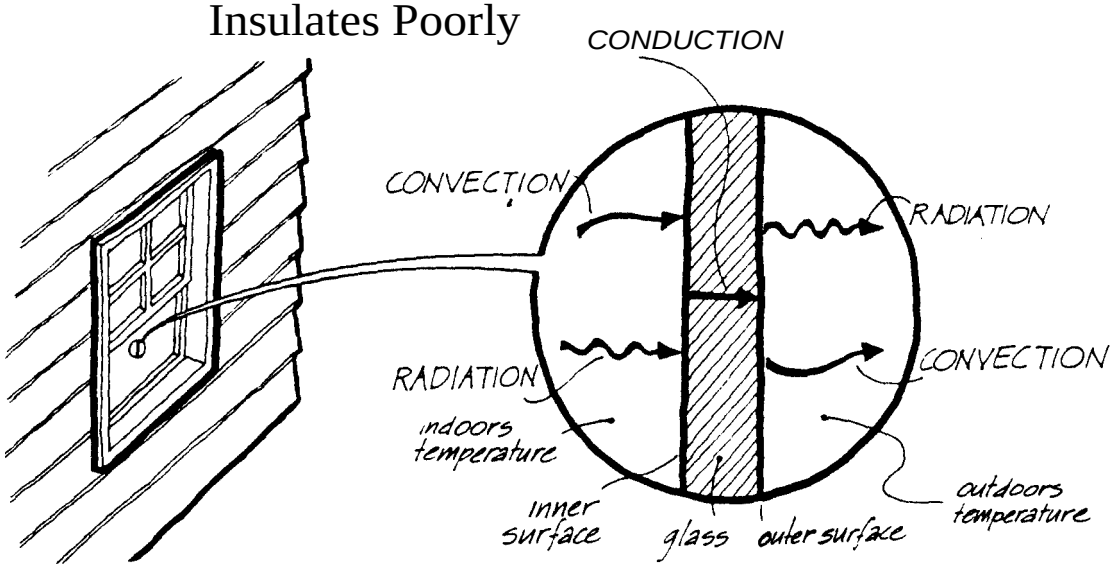
Large Heat Loss Through Windows



Window heat loss takes place by conduction, convection, and radiation. Heat is convected and radiated to the inside surface of the glass by the warm room. Even though we can see through glass, in terms of radiation heat flow it's as if the glass weren't transparent at all: the glass prevents radiation heat from flowing directly outside. Once the heat reaches the inner surface of the glass, it is conducted through the glass. Glass is a good conductor, so the heat flows easily through the glass to the glass's outer surface. Once there, the heat flows outdoors by means of convection and radiation. Since the wind is often blowing outdoors, heat leaves the window's outer surface very easily.

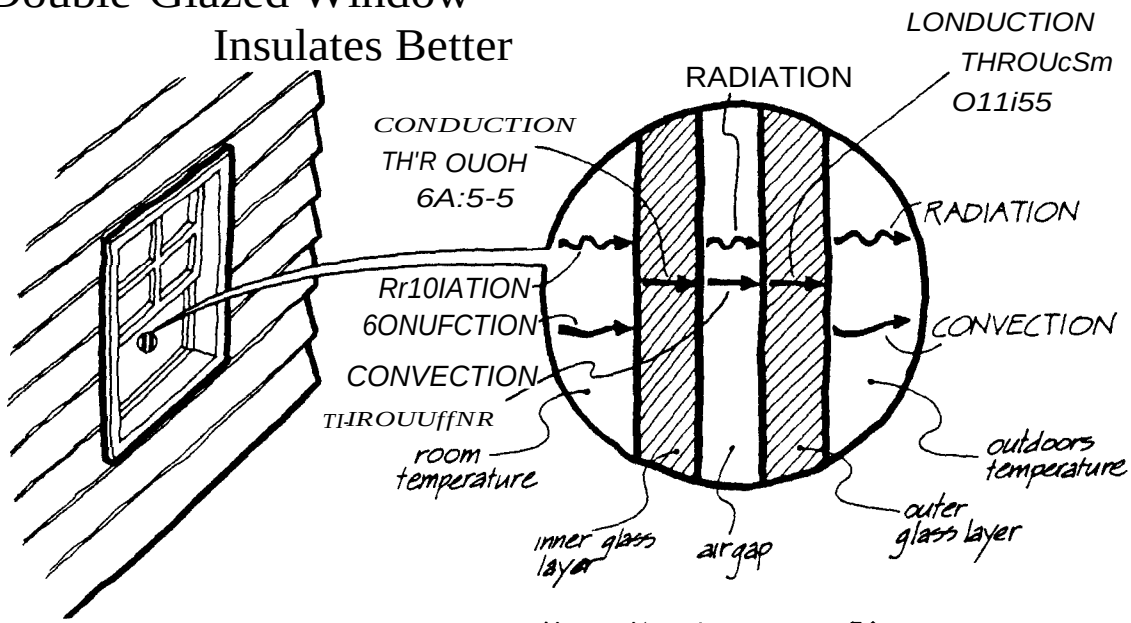
The net effect of all these combined heat losses is that windows aren't very good insulators. Heat losses through windows can be cut down by using two layers of glass-as in *doubled-glazed* windows or storm windows. A double-glazed window has an air gap between the glass layers, so it's much harder for heat to flow through it. As with glass made of a single layer, it flows by convection and radiation to the window's inner

Single-Glazed Window Insulates Poorly

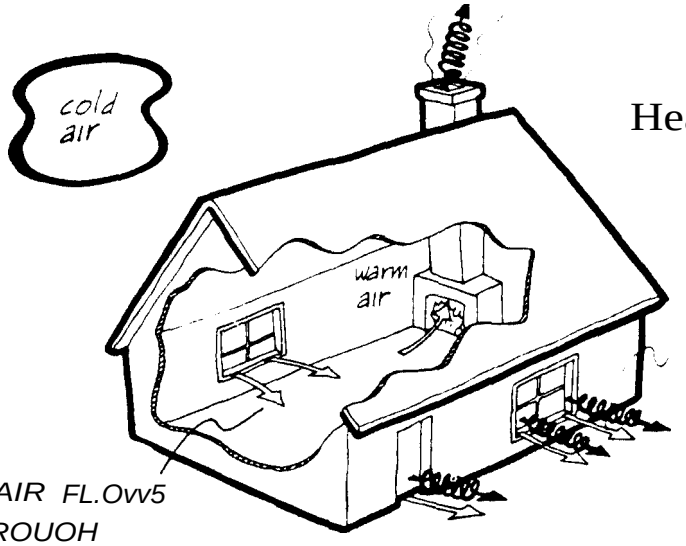


surface. Then it flows by conduction through the first glass layer, by conduction and radiation through the air gap, by conduction through the outer glass layer, and finally by convection and radiation to the outdoors. Double-glazed windows lose about half as much heat as a single-layered window; most of this effect is due to the fact that the air gap acts as a good insulator.

Double-Glazed Window Insulates Better



The third major heat loss from a house is by infiltraff"1 warm air leaking out through cracks in the walls, doors, windows and being replaced by cold outdoors air. Infiltrattam can account for one-third of the heat loss of an uninsulatod house and a half or more of an insulated one. Many houses poorly built, and thus have quite a bit of air infiltration. On other hand, if a house were completely sealed it would f stuffy. In any case, cutting down on infiltration is an matter. Infiltration heat losses can be reduced by weather-sMp ping doors and caulking windows.



Heat Loss by Infiltration

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COLD AIR FL.Ovv5
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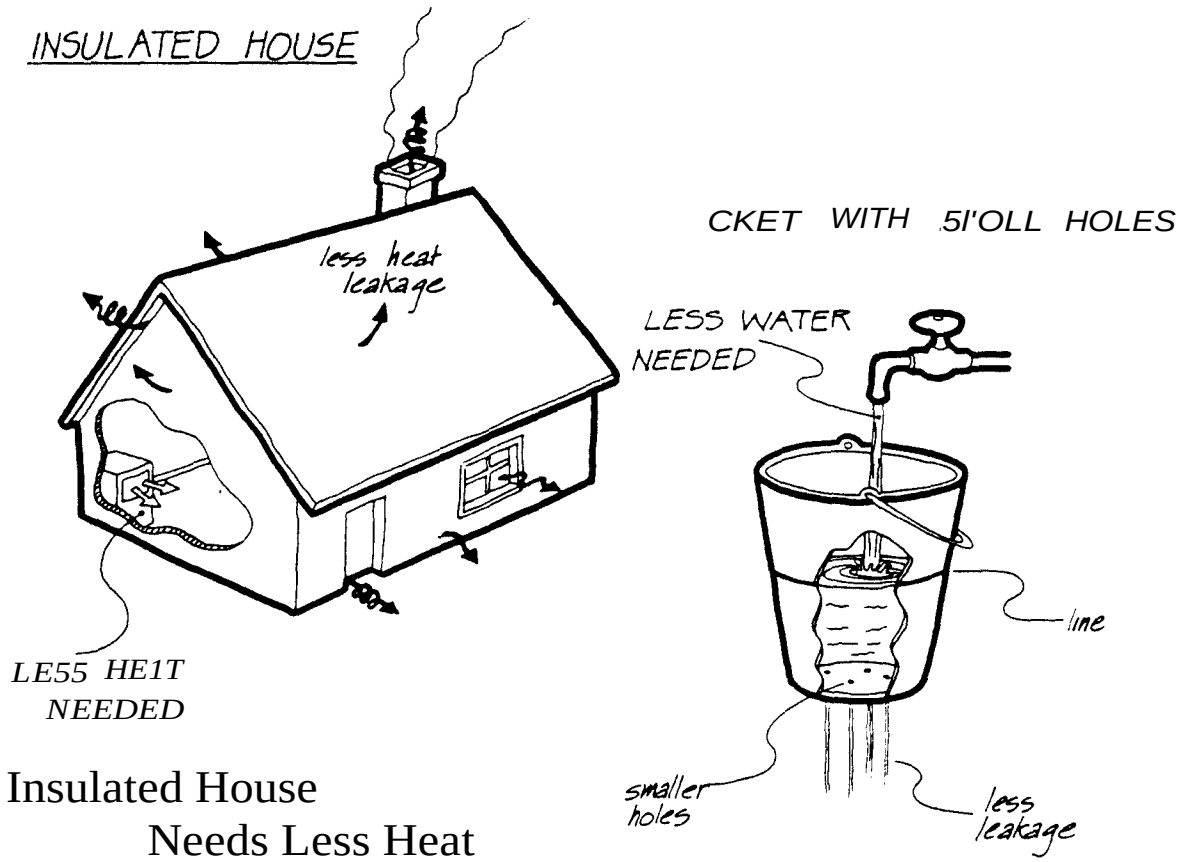
AND WINDOWS

To return to our water analogy. Recall that a house's heat losses are equivalent to the holes in the bottom of a bucket. if we insulate the house-reduce the conduction, window, JIM infiltration losses-it's like making the holes in the bucket smaller. Just as the furnace needs less heat to keep a well-insu· lated house warm, so a faucet needs to add less water to a bucket with small holes to maintain a constant water level.

On the average, the furnace adds exactly what heat leaks out of the house. If less heat leaks out, the furnace uses less and your heating bill is less. Similarly, on the average the faucet adds the same amount of water to the bucket as leaks out of it. If



Insulated House
Needs Less Heat

the holes in the bucket are smaller, less water leaks out through them and less water is needed from the faucet.

Conserving heat in a house by better insulating is probably more important than solar heating the same house. A solar heating system that could save half of your heating bill might cost several times more than better insulation, which could also save half of your heating bill. If your house is already *well* insulated, *then* solar heating is probably worth the expense.