

Aspen Ten (天)

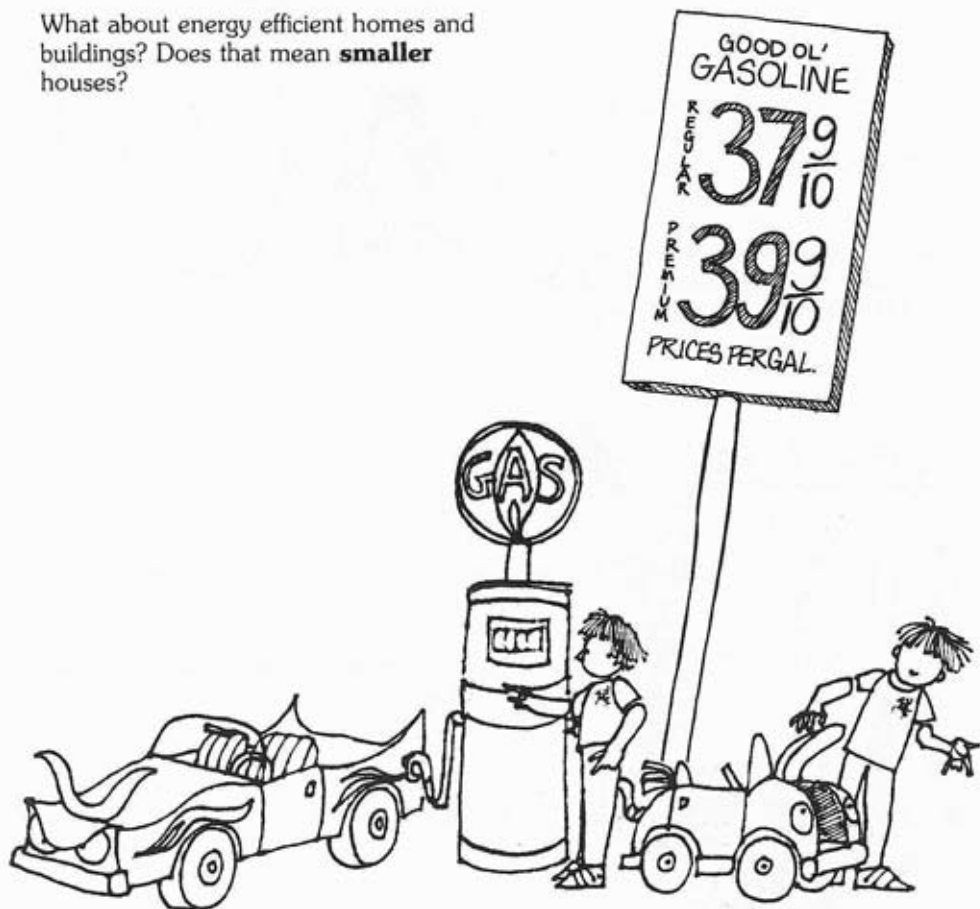
*Shoji - Serene Form, Versatile Function*



**SOLAR- JI**  
**ENERGY EFFICIENT WINDOW INSULATION**

Remember when gas was less than 50¢ a gallon, and everyone was curious about those funny little economy cars? Needless to say, all of us feel the impact of the high cost of energy and its shortage in just about everything we do. Now better energy efficient cars, trucks, planes, and appliances have become common and the list grows each day.

What about energy efficient homes and buildings? Does that mean **smaller** houses?



New construction does include many techniques that reduce the energy use of structures built today. What about older buildings that we already occupy? Making sure that our home or building is properly insulated is very important in energy efficiency. The federal and most state governments have energy conservation plans that include tax **credits** (not deductions) to people who insulate their homes and businesses.

Most of us know about the importance of insulating the ceiling, walls, and floors, but insulating windows is much more complex.

**Single-glazed windows can be blamed for as much as  $\frac{1}{3}$  of the total heat loss of a building.**



If we used the same R-19 Fiberglas that insulates walls and ceilings over windows, it would stop most of the heat loss, but would also block out most of the sun's daylight, which is one of the window's most important functions!

**So, how do we reduce heat loss in windows?**



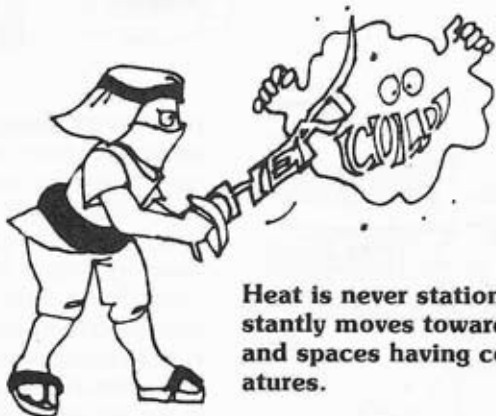


HEAT



RADIATION

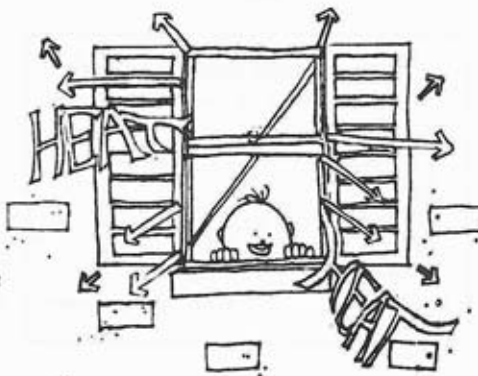
Heat and Radiation are the two main characters.



Heat is never stationary; it constantly moves toward materials and spaces having cooler temperatures.

Heat loss in windows occurs in two ways: **air infiltration** and **conduction**.

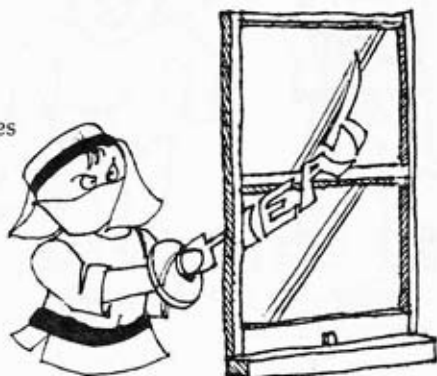
There are numerous cracks and openings "around" windows and doors that allow heat to escape by going around the barrier that windows and doors try to create. When these cracks are large enough, we can actually feel the cold air being **forced** inside by the pressure of the outside wind. This movement of air **around** windows and doors is known as **air infiltration**. Unless these cracks are too numerous, weather stripping and caulking can be cost-effective ways to plug up **air infiltration** losses. We can also use the "blanket" approach and cover the entire opening with an air tight cover.



HEAT ESCAPING THROUGH CRACKS.

## 4 HOW WINDOWS LOSE HEAT

The big culprit of heat loss in single-glazed windows is when heat actually travels **through** the glazing and escapes to the outside.



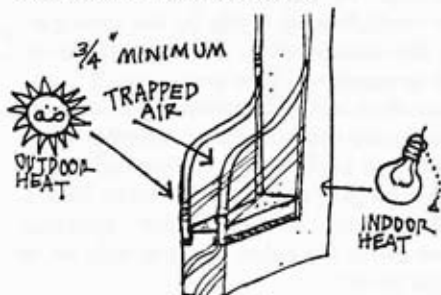
Heat moves **through** all materials, including air, from one particle to the next. Compare heat with water that is traveling **through** a pipe. Some materials are like large pipes and allow large amounts of heat to pass **through** them. Some materials are like small pipes and allow only small amounts of heat to pass through. We cannot stop heat from moving **through** materials, so we are better off choosing materials that are like small pipes. The movement of heat **through** materials in this way is called **conduction**.

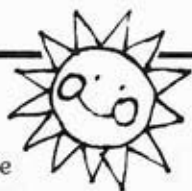
Metals and glass do not insulate well at all. But "**still**" or "**trapped**" air is a good insulator. This still or trapped air is what actually makes double or triple-glazed windows insulate well, as the glazing itself is insignificant.

### Rate of Heat Conduance

(BTU-in./ft.<sup>2</sup>/hr.-°F)

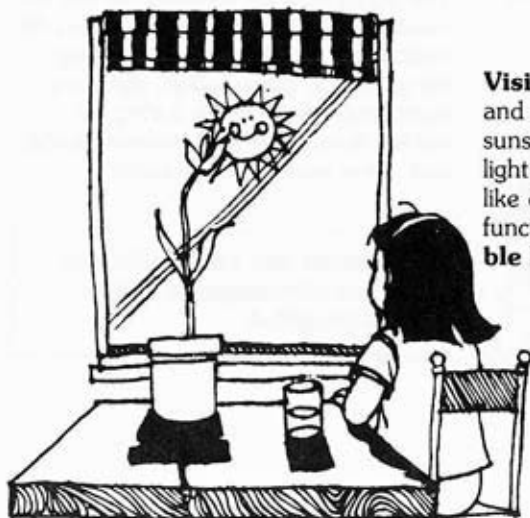
Aluminum	1,450	(larger pipes)
Steel	310	
Glass	5.5	
Wood	0.8	
Polystyrene	0.2±	
Still Air	0.2±	(smaller pipes)





The sun's energy comes to us in three main rays or **radiation** bands.

The smallest wave is invisible and is known as **ultra-violet (UV) radiation**. UV rays are responsible for most of the yellowing, color-fading damage from exposure to the sun. It also causes sunburned skin and eye damage. Dark-colored glazing can reduce UV transmission, but also reduces what we see as **visible** daylight.



**Visible radiation** is the second band, and is also the largest of the rays of sunshine. Without sufficient **visible** light we would need artificial lights, just like during the night. One of the main functions of a window is to let this **visible** light into a building.



The third band of the sun's energy is the part that allows "Solar Heating" to work. This is known as **infrared (IR) radiation**, often mistaken as **heat**. **IR radiation is not** actually hot. It acts like radio signals sent from a radio station, traveling through space very quickly.

Only when this radiation is **received** by an object (similar to a radio picking up radio signals), does the object become heated.



**IR radiation** also acts differently from **heat** because radiation **can** be reflected, whereas heat **cannot** be reflected.



The mirrored glass buildings we see so much of are **not** reflecting heat, but **IR radiation**. This is good for keeping things cool in the summer. But if we want **free** solar heating during the winter, these mirrored windows would **not** allow much warmth inside.

**We must use solar radiation to our advantage; it is free and plentiful.**



**Everything has IR radiation** and shares this energy with everything else.

The sun shares **IR radiation** with the Earth, the Earth with people, people with plants and trees, and on and on. Whatever is warmer gives to that which is cooler. This constant exchange of **IR radiation** can cause heat loss from buildings, especially through windows.

Objects in the room **radiate** energy to the cooler window areas, which pick-up this **radiation**. This in turn **heats** up the uninsulated windows, and about  $\frac{1}{2}$  of this **heat** is passed on to the outdoors. This is known as **radiant** energy loss.

**Radiant loss** from a building can be as much as or even more than the loss by **conduction!**

One must be careful when selecting **permanently** attached window reflectors of **radiant** energy since a benefit under one condition or season may create even **more** consumption of energy under another.



## One Installation / 3 Basic Modes

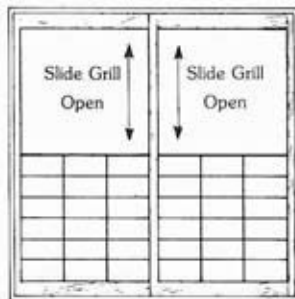
1



Maximum insulation, privacy, air filtration, and glare protection. Recommended:

- When unoccupied or nights
- Winter days on north side
- Summer direct sun sides

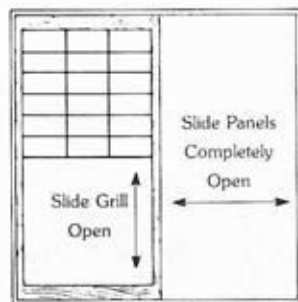
2



Outside view, daylighting, and partial privacy, in addition to insulation and air filtration protection. Recommended:

- Additional daylighting needs
- Winter direct sun

3



Easy access to primary window, maximum daylighting, outside view, and ventilation (on operable primary windows). Recommended:

- Partially open for ventilation
- Winter day maximum direct solar gain

Options with the  
"Flexible System"

All Solar-Ji panels can accommodate different types of insulating glazings. This "Flexible System" allows fine tuning to maximize energy efficiency — a benefit for solar applications.

Aspen Ten 

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**Uninsulated single-glazed windows are the largest single cause of heat loss in most buildings.**

During the winter, well designed window systems can not only reduce heat loss, but can also **gain** heat and be a **benefit** to your heating system.

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Window systems should be designed for many purposes. They should:

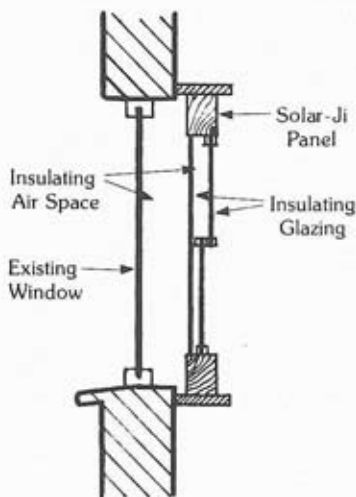
1. Provide solar radiation gain to help warm a building in winter.
2. Reduce solar radiation gain to help cool a building in the summer.
3. Provide good insulation and air tightness.
4. Accommodate natural ventilation and access in case of emergencies.
5. Maintain year-round daylighting.
6. Provide both privacy and an outside view.
7. Be easy to operate and aesthetically pleasing.

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To accomplish all of these necessary functions is no simple task! That's why many products good for one purpose fail miserably for another.

Example: Permanently attached sun control films, which reduce heat gain in the summer, make it impossible to use the sun's **free** energy to warm a building in the winter.

**Solar-Ji window insulation** is designed to accomplish **all** the functions of a window because it is a **flexible system**.



- Solar-Ji** is added to any existing windows and doors to create an additional double-glazed storm window barrier over the entire opening.
- Solar-Ji**, added to single-glazed windows, perform better than triple-glazed windows and can reduce those losses by at least 50-70%.
- Solar-Ji** panels are movable by sliding to the left or right (in most installations). In **addition** to this, the white translucent grills within each panel can slide up and down to provide multiple uses.
- Solar-Ji** incorporates a unique **flexible system** that can accommodate insulating glazings combinations to "fine-tune" **Solar-Ji** panels to each season and orientation (north, south, east, west), and utilize the latest technological developments in selective film products.

## Solar-Ji Window Insulation

