



SOME THINGS OLD

Your grandparents and great-grandparents knew what they were doing. The design and orientation of their homes were crucial in creating a comfortable living space before the advent of centralized heating and cooling. Thanks to the current trend in green building, attention has again been placed on these time-tested methods. Homes designed around the conditions in which they are built not only use less energy, but also are more comfortable. Consider some basic principles of design and orientation from the following examples:

1 Homes designed for warmer regions emphasize shading and passive ventilation. They

are long and narrow, minimizing exposures from the east and west where the sun is most direct. Homes designed for colder regions (not shown) work to passively collect and preserve heat. They are traditionally more compact in shape to minimize exterior surface area, retain heat and reduce overall heating needs.

2 Windows are minimal on these sides for the same reason.

3 Porches and deep roof overhangs offer protection against the harsh summer sun.

4 Awnings shade windows and walls in warm climates. To passively capture heat in cold climates, windows are placed on the

south side and aren't shaded by awnings or overhangs.

5 Deciduous trees shade the east and west walls in warm climates. In winter, when trees lose their leaves, the house benefits from the sun's warmth. In cold climates, evergreen trees are planted as a windbreak on the north/northwest side.

6 Higher ceilings allow heat to rise above occupants in warm climates. In cold climates, ceilings are lower to keep heat where it is needed.

7 Light exterior colors reflect the sun's heat. Dark exterior colors absorb the sun's heat.

continued on page 26



SOME THINGS NEW

continued from page 23

- 1 Sealing and insulating are not exactly new, but they remain the most important step in improving a home's efficiency. Use weatherstripping around windows and doors and caulks and spray foams around window frames, pipes, fixtures and other gaps. Attic floor insulation is typically the most cost-effective investment whether you do it yourself or hire someone to do it for you. Don't forget to seal and insulate ductwork as well. For the benefit of your health, consider using sealants that are low in volatile organic compounds (VOCs) and a form of formaldehyde-free insulation. VOCs are emitted as gases from certain solids or liquids and include a variety of chemicals, some of which may have short- and long-term adverse health effects.
- 2 Compact fluorescent lamps (CFLs) are profoundly more efficient than traditional incandescent light bulbs, which waste up to 90 percent of the electricity they consume in creating heat. An estimated \$25 to \$45 can be saved per CFL over its lifetime. The newest generation of CFLs is finally coming of age and even includes dimmable bulbs.

Stick with 2700K (Kelvin) lights — Kelvin, a unit increment of temperature, measures the color temperature of light sources — for interiors to best match the warmth of incandescent bulbs.

- 3 Programmable thermostats offer one of the easiest and most affordable ways to save energy at home. They can save almost \$200 per year by reducing household heating and cooling at times when it's not needed.
- 4 Geothermal comfort systems quietly provide reduced-cost space conditioning and near-free hot water. Heating and cooling are the largest energy expenses for most homes, typically accounting for more than half of energy used. As the most energy-efficient heating and cooling systems available, geothermal systems harness the renewable energy of the sun by using the earth as a heat exchanger. The systems go by many names including Geo-exchange and geothermal heat pumps.
- 5 High-tech double- and triple-pane windows with low-emissivity (low-E) coatings — virtually invisible layers of metal or metallic oxide that reduce the amount of heat that passes through the glass — are vastly

more efficient than single-pane windows. For this reason, replacing windows is often a top choice when considering major renovations. Such windows are very expensive and should be much lower on your priority list than good old caulking and insulation. For a low-cost alternative, apply a low-E film to existing windows. It is effective both in reflecting unwanted heat in summer and in retaining heat in winter and is widely available as a do-it-yourself kit. Solar screens are still another choice and particularly appropriate for large, scenic windows. Exterior applications are far more effective in blocking heat.

- 6 High-performance water heaters will last as long as you own your home. They are equipped with a thick layer of insulating foam and a non-metal tank with no anode rod, so there is no chance for the rust and corrosion that forms in other tanks. A low-cost alternative is to add a tank "blanket" to existing water tanks so they will lose less heat. Sign up for load management to allow your co-op to manage your water heater's operation and help hold down the rising cost of power.



SOME THINGS FUTURE

1 Advanced metering devices — Many co-ops currently use digital metering to record electricity use and locate problems on lines. Some meters have two-way communication. In the future, such electronic communication tools will be more sophisticated so customers can determine when they use the most electricity and where they might reduce consumption. Time-of-day metering or rebates will probably be in effect to discourage electricity use during peak hours. Appliances will be programmable for use in non-peak hours.

2 Light-emitting diodes (LEDs) — Home applications of LEDs now are found mainly in flashlights and task lights. With a lifespan of approximately 60,000 hours — as compared to CFLs' 10,000 hours and incandescent bulbs' 1,500 hours — LEDs are a product with a great future. The market is waiting for costs to decrease.

3 Thin-film solar photovoltaics (PVs), like

conventional PVs, convert sunlight into electricity. They improve on conventional PVs by being lightweight, flexible and, most importantly, far cheaper to produce. Expect to see a variety of home-related products from several manufacturers in the next two to three years. Many believe that the greatest advancements in future solar technology will involve the use of quantum dots — tiny semiconductors that use the unique light-harvesting properties of nano-sized crystals. The science is complicated, but the result is a theoretical doubling in efficiency (estimations are as high as 65 percent) for quantum-dot solar cells — as compared to today's most efficient cells. Preliminary experiments suggest that quantum dot cells could be produced with relatively low material costs.

4 Smart windows work a lot like those funny eyeglasses that tint in the sun and then change back to clear indoors. In the case of electrochromic windows — electronically

tintable glass that can be switched from clear to darkly tinted, and vice versa — the glass responds to an electrical current that can be controlled by a switch, light sensors, thermostats or even a motion sensor. New designs — including ones that use integrated solar cells to produce power — promise greater efficiency. Thermo-reflective windows are activated only by heat, and, according to the manufacturer, they are superior in stopping heat from entering a building. Because they respond only to heat, the windows let in more heat (and light) in cold weather and block it in warm weather. The manufacturer uses a similar approach toward managing heat with an advanced thermo-reflective wall or cladding technology that can be “programmed” at the time of manufacture to reflect heat at a specific temperature. †

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