

Reducing Residential Energy Consumption Through Design

The application of smart, intentional design can reduce costs, create a positive impact on the environment and improve air quality. » by **TOVE ANDERSON** AIA, LEED AP
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RESOURCES:

High-quality informational online resources for greening the home.

Building for Environmental and Economic Sustainability (BEES)
bfrl.nist.gov/oe/software/bees.html

Energy Star
energystar.gov

Efficient Windows Collaborative
efficientwindows.org

Green Seal
greenseal.org

Greenguard
greenguard.org

Greenhome
greenhome.com

Habitat ReStores
habitat.org/env/restores.aspx

RECENT INCREASES IN THE COST OF GAS HAVE SPURRED INTEREST FROM CONSUMERS, THE MEDIA AND POLITICIANS ALIKE. Ironically, however, we Americans use more energy and spend more money on energy consumption in our homes, and we tend to own them longer. While many drivers have not yet modified their automobile energy usage, the potential for savings in the residential sector is enough to make both Prius and Hummer owners take notice.

This being the case, it is necessary that we, the design industry, make an honest effort to educate consumers, developers and builders on the details of eco-friendly design. From the resident's perspective, these ideas often create a healthier, more enjoyable living space. The notion that green architecture costs more or sacrifices comfort simply is not true. The following examines environmentally responsible energy use only; that these savings also create positive impacts on the environment and improve air quality only makes the investment smarter.



THE BOTTOM LINE » Approximately 10 percent of the monthly cost of owning a home (principal, interest, energy and water) is spent on energy. Though smart design can cut the costs of those utility bills by 50 percent, developers and homeowners need a yardstick to evaluate return on investment. Based on a 9-to-1 mortgage to energy ratio, every 10 percent reduction in energy costs yields a 1 percent reduction in monthly ownership costs. For example, consider a household planning to spend \$2,000 per month on mortgage and utility payments. A \$500 investment on insulation during the design phase often cuts energy costs by 20 percent. That investment will pay for itself in less than

two months. Furthermore, energy-efficient design adds costs to the principal, so costs can be offset in the loan, yielding greater tax benefits and resale value. As oil and natural gas prices continue to skyrocket, the break-even point is even closer.



CLIMATE CONTROL » The Department of Energy reports 56 percent of energy costs involve heating and air conditioning. Ensuring efficient climate control is the easiest opportunity for recouping costs and using less energy. The obvious target is selecting efficient furnaces and air

conditioners. The Energy Smart system easily communicates the efficiency of each system in a "dollars-per-year" framework. Properly sized units are often more efficient than larger units that cycle on and off more frequently and create a more comfortable climate.



INSULATION AND AIR INFILTRATION »

Insulation is one of the simplest and cheapest options for reducing energy costs. New products provide structural support and noise barriers as well. Advances in insulation include radiant barriers, reflective insulation and foundation insulation. The Department of Energy has a ZIP Code Insulation Calculator (ornl.gov/~roofs/zip/ziphome.html) with insulation recommendations based on ZIP code and type of construction.

Also consider deliberate design, which can take advantage of natural insulation opportunities: Natural shade, reflective surface materials and attention to dominant weather patterns can reduce heating costs by more than 50 percent. Interior shades help reduce energy costs but are less effective than trees, awnings or

natural overhangs. Placing water lines and HVAC ducts in interior walls provides additional insulation. Finally, sealing all cracks around doors, windows and penetrations is among the easiest and cheapest investments for residences. Without clear direction from architects, this detail can be overlooked. For a few hundred dollars allocated to insulation and blocking infiltration, the temperature and air quality will be more consistent throughout the home, while reducing costs and consumption by 30 percent.



ENERGY-EFFICIENT WINDOWS » Specify windows that relate to the climate. Double-pane windows have an effective air gap for warm and cold climates; low-e coatings help reduce the UV infiltration. Air leakage ratings should be 0.3 cubic feet per minute or less.




FRESH AIR » One of the negative consequences of a "tight" building envelope with little air infiltration is that the indoor air is not sufficiently replenished with fresh outdoor air, which is essential to maintaining healthy indoor air quality. The best heating and cooling systems use fresh air on the intake side, passing it through a heat exchanger so the warm air being exhausted heats the cold incoming air.



ENERGY-EFFICIENT APPLIANCES » Special attention to major appliances dramatically reduces energy demands. Many Energy Star appliances consume 25 to 40 percent less energy than their conventional counterparts. For a refrigerator, a 40 percent reduction in energy will save \$75 per year.

Over the lifetime of the appliance, the savings will pay for the initial investment many times over. Tankless water heaters, which are about the same price as standard water heaters, use two-thirds of the energy of traditional water heaters and never run out of hot water. Gas ovens with electronic ignition consume 30 percent less energy than electric ones. Electric ovens with halogen or induction elements consume far less energy than conventional resistance-coil elements.



BUY LOCAL » A considerable portion of the total cost of building materials is due to transportation. Specify products and materials native to the site or those that are manufactured locally. Local products have the added benefit of supporting the local economy. 



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