

LAKESIDE COURT: AN ENERGY EFFICIENT HOUSE

The design and construction of a new house according to current environmentally thoughtful, sustainable, "green" practices offers many rewards but entails a variety of ironies, compromises, frustrations and practical problems as well. This website is intended to document the process involved and lessons learned in building this lakeside house in Evanston, Illinois. The owners, architect and builder hope to encourage and assist other owners, architects and builders with "green" intentions who are considering a project in this direction.



During the actual design and construction phases for this house, a website was developed to keep track of the information being gathered to answer the many technical questions involved in "green" building and to follow the progress of the new house. This new website provides a more streamlined introduction to the design and construction issues addressed and includes post-construction observations as well as links to the original [website](#).

OVERVIEW--Fighting global warming

Average global temperatures are increasing at the fastest rate in recorded history, a trend that leading scientists believe is likely to cause extensive damage to forests, marine ecosystems, and agriculture as well as bring other disastrous consequences, including drought and water shortages, rising sea levels and coastal flooding, and more extreme weather conditions. Compelling evidence points to human sources of carbon dioxide pollution--primarily from coal-burning power plants and from automobiles--as a major cause of this warming.

Concerted action by individual citizens and by governments at all levels is needed to address this very serious problem. Reducing energy consumption, increasing our reliance on renewable energy sources, making use of energy-efficient technologies, setting high standards--all are important strategies for reducing greenhouse gas emissions.

With this in mind, a major goal in building this house was to make it as carbon-neutral as possible. Although performance results to date are more modest than projected originally, the house has achieved a significant level of energy efficiency. In their daily monitoring of their energy usage, the owners find that they are using 70 percent less electricity and 60 percent less gas than they did in their former 1920s house, which was of comparable size. And in a home energy audit, the house earned a Home Energy Rating System (HERS) score of 92.7 for certification as an ENERGY STAR home. (A

score of at least 86 is required to meet ENERGY STAR standards.)

Outlined below are the major aspects of design and construction that have contributed to the high energy performance of the house.

Designing for efficient use of land and energy

The new house occupies less ground area than the previous 1950s house on the property. While it can be argued that tearing down a house is wasteful in and of itself, it is also true that current building practices can result in buildings which are much more energy efficient, as is the case with this house.

Although the new house is relatively large (4,000 s.f., plus basement and garage), an obvious design objective was to take full advantage of the site by providing dramatic views of Lake Michigan. The open floor plan was intended to accommodate larger groups of people attending civic and charitable events hosted by the owners. Moreover, the house conforms to some "small house" principles, such as flexible uses of certain spaces. The first-floor guest room is used as a TV room and library, for example, the sunroom is used by the owner/professor for meetings with colleagues and students, and the second-floor home office could become a fourth bedroom, if the owners needed it.

Design features which contribute to energy efficiency include the mudroom/airlock at the front entry, the centrally located, open stairwell creating natural stack ventilation, tall windows and skylights that provide light deep into living spaces, and orientation of major windows to the south for passive solar gain.

Reducing energy consumption

The owners have taken many steps to reduce their overall energy consumption, and many of these are reflected in the design and use of the house:

- Compact fluorescent lights (CFLs) are used in almost all the light fixtures.
- Exterior landscape lighting is solar-powered.
- Ceiling fans in the main living areas and natural ventilation minimize the need for air conditioning except on the very hottest of days.
- Window shades are used routinely--to block the heat of the sun in summer and to retain heat at night during the winter months.
- Appliances (dishwasher, clothes washer and drier) meeting Energy Star standards were selected.

Heating the house

Solar hot water collectors provide most of the heating for domestic hot water, some of the radiant floor heating, and all of the heating for the exercise pool. The Illinois Department of Commerce and Community Affairs (now called the Department of Commerce and Economic Opportunity) contributed \$5,000 towards the cost of the system through its Renewable Energy Resources Rebate Program.

A highly efficient advanced combustion fireplace serves as an additional source of heat.

Natural-gas-fired boilers complete the heating system.

Producing electricity

Photovoltaic slates on the three south-facing roof surfaces generate roughly 80 percent of the total electricity consumed over the course of the year. On sunny days, excess electricity generated is sold to Commonwealth Edison, which in turn provides electricity to the house on cloudy days and at night. A battery back-up system is in place and will provide electricity to key systems and appliances in the event of a ComEd power failure. A state grant of \$6.00/watt contributed \$38,300 toward the considerable cost of purchasing and installing the PV system.

Using renewable, recycled and locally available materials

Building materials selected for the house were predominantly those having a low environmental impact. Certified wood and engineered lumber were used in the basic construction of the house, wood alternatives were selected for the flooring, and recycled wood was used as a design element in several locations. Regional availability was a factor in the choice of the stone used for flooring and for the terrace. Tiles made from 100 percent recycled glass were used for the kitchen backsplash.

Conserving water

Dual-flush toilets were installed, reducing the owners' water consumption by an estimated 5,000 gallons/year. Permeable driveway pavers stop rain water runoff into the storm sewers and replenish the water table. Roof gutters direct rainwater into a 1000-gallon underground cistern for use in watering the garden. And the landscaping includes low-maintenance native grasses and drought-resistant plants.