DESIGNING ENVIRONMENTALLY CONSCIOUS HOMES

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The purpose of this paper is to outline four strategies to design environmentally conscious homes. During the past decade, the concept of environmentally conscious housing has attracted global attention from built environment professionals. In 1990, the American Institute of Architects formed a Committee on the Environment, and has since published *The Sustainable Design Resources Guide* (AIA, 1995). The Declaration of Interdependence for a Sustainable Future was signed by over 3,000 architects in 1993 (Crosbie, 1994). The Building Services Research and Information Association in the United Kingdom recently published an *Environmental Code of Practice for Builders and Their Services* (Halliday, 1994).

The National Association of Home Builders and the Rocky Mountain Institute are currently analyzing the life-cycle costs and benefits of alternative building materials (Dailey, 1997). Alternative building materials and products have been introduced by several manufacturers, and some industries have evaluated the environmental and health impacts of the materials that they specify (Lesser & Roodman, 1995). *Environmental Building News* (1997) has produced a checklist on sustainable building techniques and materials. Other worldwide organizations have contributed to research efforts and provided educational opportunities relating to environmentally conscious housing.

There exists an excellent rationale for designing environmentally conscious housing. Buildings account for one-sixth of the world's fresh water usage, one-quarter of its wood harvest, and two-fifths of its materials and energy consumption (*Professional Builder*, 1995). At a time when approximately 11,000 board feet of lumber is needed to build a typical American single-family house, wood supplies have become unstable and increasingly costly (Rocky Mountain Institute, 1996). Additionally, a growing number of consumers are interested in environmentally conscious homes. According to an Edison Electric Institute survey, 73% of adult Americans are interested in environmentally friendly housing features (*Professional Builder*, 1995).

Environmentally conscious housing begins in the planning and preparation stages by building with the site in mind. *Environmental Building News* (1997) as well as other organizations offer these recommendations:

- Conduct an exacting site analysis to determine house placement that minimizes environmental impact.
- Utilize solar orientation and existing vegetation to take advantage of sun and winds.

- Protect trees and topsoil during site work.
- Reduce job site waste by centralizing cutting operations and by recycling.

Effective landscaping can also provide visual pleasure to occupants, soften visual impact, create secure feelings and privacy, and reduce noise. Earth sheltered housing, where the ground over the roof can be left undisturbed and can be utilized with indigenous landscapes, is one form of environmentally conscious housing based on site considerations.

Builders as well as consumers need to consider the use of natural and recycled materials in construction. The Center for Resourceful Building Technology (1997) has compiled a listing of such materials. Examples include:

- A mixture of recycled newspapers and soybean resin which simulates granite.
- The poured-in-place basement tested by the National Association of Home Builders.
- Engineered wood products based on gluing wood chips, strands, or laminates together, such as laminated veneer lumber, laminated strand lumber, and stress-skin panels.
- 3-D panels sprayed with concrete.
- Honeycomb-shaped floor panels and insulation made from recycled paper.
- Framing with steel, involving steel studs, joists, and rafters.
- Floor tiles made from automotive glass, carpets made of recycled plastic bottles, plank plastic, and bricks made from oil-soaked soil.

Other suggestions include that materials be locally available, naturally occurring substances, durable, efficient, and recycled or renewable. Materials that require less energy during the entire life-cycle of a house have lower environmental impact. The straw bale house is an example of environmentally conscious housing based on materials used in construction.

Energy conservation in homes has long been a concern for built environment professionals and consumers alike, and it is a significant element of environmentally conscious housing. Two recommended approaches involve using energy efficient mechanical systems and utilizing renewable energy resources for heating and cooling. Suggestions include incorporating:

- Compact fluorescent lighting combined with dimmer switches and occupancy sensors.
- Clerestories and superglass windows, with triple-pane glass and heat reflective coatings.
- Systems for whole-house automation controlling energy use.
- Photovoltaic cells that convert sunlight directly into electricity.
- Cutting-edge home appliances using fuzzy logic such as ultrasonic dishwashers, microwave clothes dryers, and horizontal-axis washing machines.

Well-designed passive solar homes have the potential of being environmentally conscious housing. Interior spaces can be designed according to activities to take advantage of available sunlight, such as grouping the living space on the sunny side of the house and using service and circulation spaces as a buffer to the shady side in cold climates. Some builders focus on interior climate control, which implies using solar orientation to create comfortable spaces while controlling overheating and glare.

Controlling the health effects of building materials and human activities is important for environmentally conscious housing design. Many interior materials contain toxins which are found in treatments, additives, and adhesives. The following might be incorporated:

- Water-based, low VOC paints.
- Air-to-air heat exchanger, with its advantage of reclaimed heat.
- Low toxicity sealants that minimize formaldehyde discharges.
- Ventilators in closets, kitchens, bathrooms, and garages.
- Gas fireplaces.

Consideration of healthy material alternatives that have no or low toxic emittance, perhaps by applying risk assessment, is crucial for controlling indoor air quality.

The current goal of environmentally conscious housing design is to create homes that are ecologically sound, sustainable, and healthy for occupants, and for built environment professionals to learn "how to use less better." The future of environmentally conscious housing design depends on the willingness of built environment professionals and home buyers to change their ideas about how homes ought to be constructed. Additionally, the development of an infrastructure to develop, demonstrate, and provide information on environmentally conscious housing is critical. The recent formation of the U.S. public-private Partnership for Advancing Technologies in Housing (PATH) may be one important step in establishing such an infrastructure.

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*This research was supported by Regional Research Project W-183, Colorado State University Agricultural Experiment Station.