A Reprint from *Tierra Grande*, the Real Estate Center Journal

Green Building

By Harold D. Hunt

***BREEZEWAYS** provide natural ventilation for this Austin home. Photo by Bob Beals.*

"Green" homes are sprouting everywhere. Each day, more homeowners are convinced that implementing energy-efficient and resource-efficient design and construction techniques in residential construction is the right path to take. Nowhere in Texas is this sentiment stronger than in Austin, a city that has long been known for its pro-environment culture.

In April 2002, the Sustainable Living Alliance, Newmark Homes, the City of Austin Water Conservation and Texas Solar Energy Society produced a self-guided tour of 21 Austin area homes in conjunction with Earth Day. The tour showcased sustainable or green building and landscape techniques that are attractive, practical and affordable.

"The tour featured some of the best examples of environmentally friendly building practices in the state, if not nationwide," says Kathryn Houser of the Sustainable Living Alliance.

Green Building Defined

The National Association of Homebuilders broadly defines green building as constructing homes in a manner that conserves resources. Although green building can affect virtually every aspect of the development and construction process, as well as the physical structure of the house, it is not an all-or-nothing proposition. Green building projects typically incorporate at least one of the following:

- land planning and design techniques that preserve the natural environment and minimize disturbance of the environment;
- site development methods that reduce erosion, minimize paved surfaces and runoff and protect vegetation, especially trees;
- water conservation systems, both indoors and outdoors;
- energy-efficient heating/cooling systems, appliances, lighting and building envelope;
- material selection based on recyclability, durability and the amount of energy used to create the material; and
- waste reduction, reuse and recycling during construction and throughout the life of the home.

Green building practices vary by location because of differences in climate, availability of materials and local customs and preferences.

More than a decade ago, the City of Austin developed a green building program that provides consultation services, technical seminars, a directory of green building professionals, a resource library and presentations to interested groups. The program was recognized at the 1992 Earth Summit by the United Nations Local Government Honours Programme as one of 12 exemplary local government initiatives from around the world. It was the only U.S. program recognized.

The Austin Green Building Program rates new homes and remodeled homes of builders or architects who are program members on a scale of one to five stars. Rated categories include energy efficiency, water efficiency, materials efficiency, health and safety and community improvement. Information about green construction techniques and materials can be found at the Green Building Program's website, www.ci.austin.tx.us/greenbuilder.

Design and Location Considerations

Architects of green homes believe that energy efficiency begins with a good design and proper orientation. These are not new concepts. However, they are often a secondary consideration in the homebuilding process today. New energy-efficient technologies and materials are more effective when they are not compensating for a poorly designed, incorrectly placed home.

Popular home design features include extended overhangs or shading devices, careful window placement, covered porches

STEEL FRAMING *and styrofoam eliminate much from the termite's menu in another green home. Photo by Bob Beals.*

and the use of natural indirect light to combat hot weather, a primary concern in Austin. Ventilation often is enhanced through the use of breezeways and "thermal chimneys." Thermal chimneys use stairwells or elevated ceilings as natural cooling towers by drawing air through lower windows of the house and up through higher windows as it warms.

Many of the homes are designed without attic space. Ductwork is inside the conditioned space for greater efficiency. Build-up of overhead heat is avoided, and leaks in ductwork do not result in the loss of conditioned air.

Houses are oriented to face south when possible, thus limiting east and west sun exposure. However, orientation also is based on prevailing wind patterns, location of natural vegetation (especially trees) and minimization of overall site damage. Some homeowners choose to build on urban infill sites to promote Austin's Smart Growth initiative and simultaneously help revitalize older neighborhoods.

Use of Building Materials and Technology

Materials and technology used in green homes are generally chosen because they save energy, cut construction time, reduce waste, protect the environment or lower home maintenance costs. Some materials and technology are commonly used in home construction today while others have not been widely accepted. Only a few of the many different materials and technological innovations used in green homes are discussed here.

One of the more popular materials is **metal roofing**. Metal roofs are efficient, especially when constructed with a radiant barrier to reflect the heat and an air space between the radiant barrier and the metal roof to allow channeling of hot air away from the roof surface. Proponents of metal roofs argue that asphalt shingles tend to absorb heat during the day and continue radiating it into the house during the night. By contrast, metal roofs begin cooling almost immediately after dark.

Structural insulated panels (SIPs) are also popular. SIPs are typically manufactured by combining a wood wafer board product or steel exterior with a nontoxic foam interior. SIPs typically range in thickness from four to 12 inches and can be as long as 24 feet. SIPs can be ordered as a packaged system that arrives at the site precut with all window and door openings installed. Electrical openings may be cut at the factory or in the field.

Manufacturers state that SIPs can be designed to withstand winds in excess of 160 mph. SIPs have excellent insulating characteristics, with some homeowners reporting energy savings as high as 50 percent.

Engineered wood products (EWPs), a popular substitute for conventional solid lumber, are used in many of the homes. Engineered beams and joists offer increased stiffness, more uniform strength and shape and less weight. The length of the finished product is not limited by tree height because EWPs are manufactured from shorter pieces of wood. EWPs can be ordered in various lengths and delivered finished to the jobsite, reducing waste and saving labor. Some of the more popular EWPs are gluelam, laminated veneer lumber, parallel strand lumber and I-joists.

Steel framing is another substitute for conventional lumber. Approximately 68 percent of all steel is recycled. Stronger, yet lighter than a wood-framed construction, steel framing has no food value for termites. Steel products are either precut for studs or used in panels to build walls, steel trusses and floors.

Insulated concrete forms, including RASTRA, Autoclaved Aerated Concrete (AAC) and Faswell, were used in the construction of several green homes on the Austin tour. RASTRA, developed in Europe more than 25 years ago, is 85 percent recycled polystyrene and 15 percent portland cement. The RASTRA system produces a monolithic reinforced concrete wall with structural strength, high insulation value and extreme resistance to fire, wind, insects and mildew.

AAC was developed in Europe more than 75 years ago. AAC blocks are one-fifth the weight of conventional concrete because they are 70 to 80 percent air, which significantly improves their insulating characteristics. Blocks are glued together with a special adhesive to form a monolithic wall.

Faswell blocks, made of 85 percent treated recycled woodchips and 15 percent portland cement, were developed in Europe following World War II. Faswell structures allow a slow air exchange, preventing condensation and keeping walls dry.

Bamboo flooring is one of the more unusual products found in some green homes. Bamboo is a grass that grows extremely rapidly after harvest, as much as 24 inches in 24 hours. Proponents of bamboo flooring point out that no hardwood trees are used in its production and claim it resists scuffing, staining

and moisture damage while requiring less care than conventional flooring.

Cellulose insulation, made primarily from recycled newspaper treated with a fire retardant, is used in some green homes. One hundred pounds of cellulose insulation contains 80 to 85 pounds of recycled newsprint. Cellulose insulation is low in "embodied energy," defined as the amount of energy consumed in producing the product. Fiberglass, rock wool and plastic insulation have from 50 to 200 times more embodied energy than cellulose.

Compressed straw was another unusual product shown in Austin. Panels of compressed straw are designed to replace traditional studs and sheetrock. The product has good sound-deadening qualities and is surprisingly fire resistant. Each four-by-eight panel is made from about 125 pounds of straw that is typically grown within 50 miles of the manufacturing plant.

Age-old housing design and orientation concepts are combining with increasingly affordable and ever-improving technology to expand the popularity of green building. However, the architects who designed the environmentally friendly homes on this tour were careful not to elevate environmental factors too far above cultural, social or aesthetic concerns.

Although some homebuilders are implementing green building techniques today, many more are not yet ready to bear the risk and expense of retraining their labor force to build using the new materials and techniques. Many builders are hesitant to bid jobs using nontraditional building techniques and products because bidding incorrectly could have disastrous financial consequences. Widespread implementation of green building techniques and materials will have to be consumer-driven.

Availability of information about green building practices has improved dramatically, and consumers are becoming better informed about the monetary and social benefits of green building. Even so, building green will not become commonplace overnight.

Dr. Hunt (hhunt@recenter.tamu.edu) is an assistant research scientist with the Real Estate Center at Texas A&M University.

REAL ESTATE CENTER

LOWRY MAYS COLLEGE & GRADUATE SCHOOL OF BUSINESS

Texas A&M University
2115 TAMU
College Station, TX 77843-2115

http://recenter.tamu.edu
979-845-2031
800-244-2144 orders only

Tierra Grande (ISSN 1070-0234), formerly *Real Estate Center Journal*, is published quarterly by the Real Estate Center at Texas A&M University, College Station, Texas 77843-2115. Subscriptions are free to Texas real estate licensees. Other subscribers, $20 per year.