

Building **SUSTAINABILITY**

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Sustainability Defined

By Jennifer Langton

COURTESY OF SOUTHFACE ENERGY INSTITUTE



Photo of rosemary being planted at a Habitat house.

Welcome to our first newsletter on Building Sustainability for Habitat affiliates, staff and volunteers. From a construction perspective, Habitat for Humanity has defined sustainability as green building, saying that it is “the process of building houses in a way that lessens the detrimental impact on the natural environment.” Core components to this definition include: (1) Reduce waste, re-use, recycle; (2) Reduce long-term energy consumption of the house; (3) Healthy indoor air quality and healthier, more durable building products; (4) Wise site management.

There has been much talk among Habitat for Humanity leadership about the term “sustainable community development.” In fact, you can find it within the sixth and last stated

principle of our official mission for the organization. Organizations like the United Nations recognize that “sustainable,” “community,” and “development” work together and form an important, integrated triangle in the work of affordable housing providers. The nonprofit Rand Corporation defines sustainable development in detail, stating that “Most sustainable community definitions focus on long-term integrated systems approaches, healthy communities, and quality-of-life issues by addressing economic, environmental, and social issues. The concept recognizes that economic, environmental, and social issues are interdependent and integrated” (<http://www.rand.org/>).

This newsletter is for affiliates and

largely written by affiliates. In our first issue, we explore sustainability more from the building science perspective. I am extremely impressed by the content which affiliate staff have contributed so generously to launching this first effort.

I invite all Habitat participants to help us further define, explore and examine these issues of sustainability that today are so critical to our providing that “safe, decent, and affordable” place to live for all of humankind.

-Jennifer Langton, Environmental Resources Specialist, Construction & Environmental Resources, HFHI

A Tale of Two Affiliates

Made in the Shade in Austin, Texas

by Catherine Lee Doar

Keeping homes cool and dry is the greatest challenge in Austin's hot and humid climate. We have always designed and oriented homes and chosen materials and systems to mitigate the effects of sun and moisture. Our affiliate frequently consults with Austin Energy's Green Building program and several green architects, so we have been able to benefit from others' experience rather than guessing whether new techniques will work.

In addition to house design and site planning for maximum shade, all rooms have ceiling fans for delaying AC use until the hottest days. Large porches and windows are positioned for best use for the family and cooling the house. Trees planted on the east and west sides of the house provide shade in the morning and late afternoon.

Since most of our heat gain is through the roof, installing galvalume metal or using radiant barrier under light-colored composition shingles is our most important material choice. Our attics have continuous ridge and soffit vents. We also insulate above the ceiling to R-30. Next, we provide double-paned low-e windows with an SHGC of .29 and an R-value of .36. We use recycled cotton batt insulation in 24-inch o.c. 2-by-4 stud walls, and have no vapor barriers anywhere in the house.

As for durability, all homes have metal or 40-year shingles on the roof and Hardie siding. The rigid ductwork with R-10 insulation installed by our Sheet Metal Workers local union will last for the life of the home and is better-insulated than the R-6 flex duct

systems we used previously. Yet with free labor, it costs the same. These measures, along with those listed on the linked spreadsheet [insert link], allow us to use a 1.5 ton central AC, the smallest size readily available, to cool 1,095 square feet.

In the first several years of our green building efforts, we concentrated on energy and water-efficiency and durability. In the past few years the emphasis has remained the same, but we have placed an increased emphasis on indoor air quality, safety, and our construction's downstream effects. We use low-VOC paints and floor adhesives or simply stain the concrete floors. Efforts to find reasonably-priced formaldehyde-free products such as cotton batt insulation and solid wood cabinets have paid off. Still, our homes are built so tightly that we install a simple mechanical fresh air ventilation system. Each home also has an integral loop fire sprinkler system.

In order to reduce landfill waste and our expenses, we build all walls in our warehouse and haul them to

the site. We also recycle as much metal as we can and use as few non-recyclables, such as vinyl, as is currently practical. Dealing with the upstream issues of our materials and systems choices has been challenging, as the results seem farther away from our daily work. Still, we have tried to reduce our use of petrochemical products, including vinyls and plastics, because of the documented safety hazards to workers in some industries and the need to reduce the nation's reliance on petroleum.

Building green has increased the exposure of our affiliate in the community as well. Television coverage has been excellent, and we receive hundreds of visitors when we showcase homes on the Austin Cool House Tour. In this way we improve the public's view of our mission and accomplishments and demonstrate that environmentally friendly building is now possible for everyone.

-Lee Doar,
Design Coordinator, Austin HFH
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COURTESY OF AUSTIN HFH

Energy Efficient Homes in Michigan's Upper Peninsula

by Merle Kindred

Copper Country Habitat for Humanity is located on the Keweenaw Peninsula, jutting north into Lake Superior, where winter temperatures range from below zero to the 20s, and snowfall averages 20 feet. Since its start in 1995, the affiliate has used energy-conscious design and construction strategies in producing award-winning homes. Eighteen energy efficient homes have been built (one a rehab) using passive solar strategies. Earlier houses cost approximately \$30 to \$40/s.f., but recent costs are closer to \$50/s.f.

Passive solar heating and cooling systems are simple in concept and require little maintenance. Main living areas have large, south-facing windows, which are fixed and casement low-e, argon-filled, insulated glazing with Rv=3.7. Standard window shades are used for privacy, and heat retention or prevention, depending on the season. Day-lighting from snow reflection reduces need for artificial lighting nearly half the year.

The buildings are super-insulated packages using 2x6 studs with walls insulated with Rv=21 fiberglass batts and covered on the outside with one inch of Rv=5 polystyrene sheathing (overall Rv=26). Most houses are built on crawl spaces with

insulation and moisture proofing (two were on slabs with one having radiant floor heat). The shallow frost-protected foundation is 2 feet deep and covered with 2 inches of rigid insulation, which also extends 2 feet horizontally away from the foundation to prevent frost heave. Rv=10 XPS wraps the exterior of the exposed foundation. Ceiling insulation is doubled to 18 inches of settled cellulose (Rv=60). Air infiltration is minimized by taping joints, and caulking and gasketing all electrical and plumbing penetrations of the exterior walls.

Fresh air is supplied by a heat recovery ventilation unit (air-to-air heat exchanger) drawing in fresh air using a low-voltage fan. Air streams pass through a filtering device where heat from the exiting stale air is transferred to the incoming cold fresh air creating a temperature differential of only 10 to 15 degrees, therefore reducing energy needed to maintain a solid state indoor temperature.

Energy savings come from direct solar gain into super-insulated living space and provide about one-third the annual heating required. There are no furnaces in these houses. A dual-warranted, 40-gallon, gas-fired water heater (set at 120 degrees Fahrenheit) provides domestic hot water and backup space heating via hydronic fin tube baseboard radiation. Gas bills average \$1.50/day and electrical bills, \$2/day. Houses are furnished with Energy Star appliances, compact fluorescent lights, and low-volume toilets and



showerheads.

Design strategy plus careful construction is crucial to the success of Copper Country HFH's homes. There has to be a willingness to learn new building skills, and it is a tribute to the affiliate's volunteers that both the experienced and novice builders have learned techniques, especially about sealing, caulking and gasketing.

The Habitat homes in Copper Country are satisfying living environments with utility bills the envy of the neighborhood. Temperature and humidity levels are comfortable, day-lighting is wonderful, and the houses are economically and environmentally viable in providing healthy environments for housing partners.

Further details about the work of Copper Country HFH are available at www.homes-across-america.org.

The affiliate's video detailing its construction strategies, entitled "Dollars and Sense: Building Energy Efficient Housing," is available for \$15 from CCHFH, Box 231, Houghton, MI 49931. You may also contact us by phone at (906) 482-5376, or by e-mail at cchfh@pasty.com.

*-Merle Kindred,
past executive director of the
Copper Country Habitat affiliate*



Promoting Green Building at Your Affiliate

by Catherine Lee Doar

The goal of Habitat is not just for each affiliate to get families into homes as cheaply as possible. The goal of Habitat is to increase homeownership to break the cycle of poverty in each community. Building green helps families to break the cycle of poverty by reducing monthly operating costs and delaying replacement costs.

You can promote green building at your affiliate by following the steps listed here.

1. Research best practices for your climate type and specific to your city, such as:
 - Your local Green Building program.
 - Local architects and designers.
 - Local and national manufacturers and vendors of green products.
 - Government and national organization Web sites.
 - HFHI Green Team (for general and specific information regarding your climate type).
2. Present findings to the decision-making constituents at your affiliate, both those who make decisions about construction materials and methods, and those who make budgetary decisions. These findings would be about:
 - Green building benefits for partner families, the affiliate, your city and the world.
 - Up-front costs and savings of green upgrades.
 - Operating costs and savings of green upgrades.
3. Agree on the changes that your affiliate wants to make.
4. Document the changes in construction practices and budgeting agreed on by the constituents.
5. Change house plans, specifications and take-offs accordingly.

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KIM MACDONALD



Upcoming Events

1. Habitat Trainings Posted at Global Training Department
 - August 4-5, 2006. Construction Track at the Habitat Charlotte Leadership Conference.
 - September 24-27, 2006. Denver, Colorado, Habitat ReStore Conference.
<http://partnet.habitat.org>
2. October 10-12, 2006. EEBA Conference (Energy & Environmental Building Association):
<http://www.eeba.org/conference>.

Media/Public Spotlight

Tout your wares! Advertise your affiliate's sustainable building practices on your Web site to volunteers and donors.

Examples:

http://www.habitatnyc.org/where_we_build/green.shtml
HFH East Bay, CA

http://www.habitatnyc.org/construction_green.html
HFH New York City, NY

Earth Day anyone?
On April 22, 2007,
start an annual
Earth Day Build
event highlighting
sustainable building
practices.



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6. Update all construction staff and volunteers on the changes and their justifications.
7. Choose subcontractors who are enthusiastic about and willing to abide by your green specs.

If you use other general contractors, perhaps during blitz builds, inform them up-front about the details of your expectations for building green. Get the builders' buy-in and answer questions long before construction starts in order to avoid confusion and last-minute substitutions of materials and systems. Before the builders meet with your construction department, send them: a written outline and justification of your goals; a list of the specific measures that you expect the contractor to take; and contact information for the responsible party in your affiliate. See attached "Green Building at Austin Habitat for Humanity" and Austin Energy five-star home spreadsheet.

8. Find vendors willing to provide green product donations or discounts to your affiliate.

For years, vendors have been providing products such as galvalume roofing, radiant barrier, and Hardie siding to our affiliate at a discount, so we started our green efforts with those products. Sometimes it is difficult to overcome the initial cost barriers to using the more expensive green materials and systems. In Austin, it has taken us several years to find vendors willing to provide certain products at a discount. For example, we tried in vain for three years to find a low-cost supplier of cotton

batt insulation at less-than-truckload quantities. When Environmental Depot opened a store here, however, they immediately offered us the insulation at a huge discount and now charge us less than we would pay for fiberglass insulation. For two years we were only able to have stained and scored concrete floors when a local contractor worked on one build per year. Last year, however, one of our staff members happened to meet a contractor who has stained and scored our floors for less than vinyl composition tile would cost.

Finding a contractor willing to properly size and install HVAC systems, as well as getting systems tested, can be a challenge. The unit size required for all of our house plans in all orientations is stated on our spec sheet. Our local Green Building Program ran the initial Manual J's for us. We are fortunate to have the local Sheet Metal Workers union install rigid ductwork in our homes. We only pay for the materials. Austin Energy and a local HERS rater perform testing for us, gratis.

Let the press and the neighbors near Habitat homes know that your affiliate is building green. Write about your green building efforts in your affiliate newsletter. Publicity can help attract donations from green vendors and combat NIMBY attitudes of those who might not understand that Habitat homes are built to high standards, often much higher standards than more expensive homes in the neighborhood.

9. Annually review products and practices with local experts and construction staff and volunteers to promote continual improvement. Check with homeowners to make sure that new products and systems work for them.

Some practices require no change in materials or systems, just

construction methods. For example, if your affiliate is already using native and well-adapted plants for your climate to reduce water use, it is still extremely valuable to consult—before site planning or construction—with a local landscape architect and arborist about site planning, grading, landscaping, tree care, and advice on homeowner upkeep. Another example would be teaching regular volunteers the particulars of proper insulation installation, so that they can insure that volunteer groups get it right from the start.

Priorities of Green Materials and Systems From Easiest to Most Difficult to Promote

1. Reduced waste equals cost savings to the affiliate.
2. Durability of green materials and systems equals cost savings to the homeowner plus reduced liability for the affiliate.
3. Reduced energy and water use equals cost savings to the homeowner.
4. Increased indoor air quality equals better comfort and health for the homeowner.
5. Recyclability of green materials and systems equals reduced landfill waste, which equals reduced cost to your city plus reduced new poverty housing created by proximity to landfills plus reduced danger of lack of raw material available to future generations.
6. Reduced pre-use and post-use external costs equals less waste plus less hazardous working conditions for product manufacturers plus less air, water and land pollution plus less danger of toxic waste streams to future generations.

Update From Canada

by *Brendan Schaefer*

Due to the extreme climate in Canada and the rising costs of energy for heating homes, Habitat affiliates in Canada are very conscious of the need to build their homes to a high standard of energy efficiency, particularly in terms of thermal insulation. Indoor air quality is also a critical factor as insulation and air sealing requirements become more stringent. Here are some highlights:

A number of affiliates in Canada are already building very energy efficient homes, some of them even to the level of R-2000, Canada's top rating in energy efficiency.

Habitat Canada has established a partnership with Ener-Quality and the new Energy Star for New Homes program in Canada. It is our goal to build Energy Star homes throughout the province of Ontario over the next five years.

For 2006 we are organizing a two-day, hands-on training session on building to Energy Star standards, as well

as Advanced Framing techniques which use less materials. This training session will be held in conjunction with the Homebuilder Expo in Toronto, where we will be building a small section of a house, which will be used for companies to demonstrate energy efficient and sustainable building products.

Also in 2006, we are working on creating a special fund to help offset the added construction costs of energy efficient features, and building to the standards of the new Canadian Energy Star for New Homes program.

A few Canadian affiliates are using SIPs (Structural Insulated Panels), which they have found are very volunteer friendly and provide exceptional thermal insulation. Our Toronto affiliate uses them almost exclusively, in conjunction with high velocity heating systems.

A number of Habitat homes across Canada have also been constructed using Insulated Concrete Form (ICF)

Systems below and above grade (to the roof) which have also proven to be very energy efficient.

Habitat Canada has established a partnership with the Canadian Institute of Plumbing and Heating (CIPH) and the Canadian Hydronics Council (CHC), who have donated a number of hydronic in-floor heating systems to affiliates over the past few years which have proven to be very energy efficient and have reduced operating costs to these specific Habitat households.

Habitat Canada is also establishing a partnership with one of the largest Canadian distributors of geothermal heating systems, to make this type of system affordable for Canadian affiliates. A geothermal system, in conjunction with a hydronic heating system, provides one of the most energy efficient ways to heat a home.

*-Brendan Schaefer,
Resource Coordinator, HFH Canada*



ICF CONSTRUCTION COURTESY OF HFH SOUTH PUGET SOUND

Resources



Product Highlights

- Austin HFH uses cotton batts for insulating walls. They have no fiberglass and so volunteers like to install them. Soundproofing is three times better than regular batts.
Found at: www.BondedLogic.com
- Metal roofing lasts the lifetime of a home and so there is no maintenance cost. In cold climates, these roofs withstand snow loads well. In hot climates, light colors are best.
The Metal Roofing Alliance Web site: <http://www.metalroofing.com/v2/content/news/inthenews.cfm>
- Several affiliates have trained their staff to install hydronic heating systems into Habitat houses: (1) Almost Heaven HFH affiliate in Franklin, WV. (2) Spokane HFH in Spokane, Wash., uses this system with a tankless water heater. This is a CMHC article from Canada with some good information.
http://www.cmhc-schl.gc.ca/en/co/renoho/refash/refash_010.cfm

In the News

- New Energy Star Qualified Homes Program in 2006,
http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.homes_guidelns09
- Indoor Air Package Developed for Energy Star Qualified Homes:
http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.pt_builder_news#indoorair
- The National LEED for Home Pilot Checklist and links to Green Builder Programs is available at:
<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=147>

Internet Resources

- **<http://www.designadvisor.org/>** *Affordable Housing Design Advisor, developed by HUD*
- **<http://www.toolbase.org/secondaryT.asp?TrackID=&CategoryID=1>**
Toolbase.org covers many topics, including Low Impact Development
- **<http://www.healthhouse.org/>** *Avoiding toxic materials, particularly for indoors*
- **<http://www.greenbuilder.com/general/BuildingSources.html#links>** *Resource index*
- **<http://www.dsireusa.org/>** *Database of State Incentives for Renewable Energy by state*

Green Building Program Samples

- **<http://www.ci.austin.tx.us/greenbuilder/>** *Austin Green Builder program*
- **<http://www.builtgreen.net/>** *Master Builder's Association of WA State*
- **http://www.southface.org/web/earthcraft_house/ech_main/ech_affordable.htm**
The EarthCraft House program of the Southeast and Mid-Atlantic areas

If you have suggestions or would like to contribute to Building Sustainability, please contact Jennifer Langton at ConsEnv@habitat.org.



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