

A Feasibility Study for Pittsburgh's Habitat for Humanity To Build More Environmentally Sensitive Homes

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Introduction: What Does Sustainable Housing Look Like?

For someone who is passionate about affordable housing and sustaining the environment I decided to study how to optimize the ability of non-profit builders, such as Habitat for Humanity, to build more environmentally sensitive homes.

An environmentally sensitive home means different things to different people. In Tucson, Arizona building a home in 2003 out of straw bales was environmentally sensitive because not only is straw a renewable resource but there was a shortage of wood, steel and concrete in the area. The materials were in high demand therefore the supply was low, causing the price to increase, which meant that it was not cost effective for Tucson HFH to build with these conventional building materials. Whereas, constructing a three-story apartment building in Vancouver, British Columbia in 2005 is more environmentally sensitive because it makes less of an ecological footprint. Environmentally sensitive homes are ones that are affordable, use the sun's energy for power, have energy efficient appliances, use renewable natural resources or post consumer materials, have healthy indoor air quality (IAQ) and encourage their homeowners

to practice sustainable ways of life such as composting and planting native species.

Building environmentally sensitive homes is part of a greater goal of sustainability, which is defined as satisfying today's needs without jeopardizing the prospects of future generations. To build sustainable homes in Pittsburgh, Pennsylvania, one must also take into consideration that it is an urban area as well as its climatic region.

To address the urban area, homes should be more than one story high, to encourage dense settlement so that the infrastructures such as public transportation, electricity lines and sewage pipes can be concentrated. There is plenty of abandoned housing stock on the main bus lines and empty lots in between existing houses that should be considered as future Habitat for Humanity home sites before resorting to building detached dwellings on the outskirts of the city. Apartment buildings and row houses are also viable options for they share materials for the walls and floors and take up less land.

To address the climatic region, Pittsburgh has cold winters and humid summers. This means that all the windows and walls should have a high insulation value, even in the attic and basement. "If included, air conditioning units do not need to have the highest efficiency rating because they only need to be turned on a few times out of the year" said Ernie Sota from Sota Construction. There should also be ceiling fans in the bedrooms, living and dining rooms to support a small air conditioning unit.

The challenge with building environmentally sensitive homes is convincing homeowners that homes can be healthy, comfortable, efficient, durable and low-maintenance without the price, otherwise known as the first cost, being drastically different from a conventional housing design. As widely-used homebuilders, Habitat for Humanity affiliates have a social responsibility to build with the environment in mind.

Case Studies

From my initial research I believe that Pittsburgh's HFH affiliate can have the greatest impact if they focus on the following three facets of environmentally sensitive design: sustainable settlement patterns, resource efficiency and indoor air quality.

The following case studies demonstrate what other Habitat for Humanity's in the United States and Canada have done to build more environmentally sensitive homes.

Vancouver-Building Up

Vancouver, British Columbia HFH has only been in existence since 2000 and yet they have already defined green design as energy efficient and affordable. Their housing units are about \$120,000 including land however that is because they do not build single-family detached dwellings.

Seattle-Material Reuse & Water Efficiency

Seattle, Washington HFH is motivated to build homes that are healthy for humans and the environment. The homes are water efficient because the landscape consists of drought resistant plants instead of water intensive non-

native lawns unless the yard is to be used for recreational purposes. They are resource efficient because they use recycled vinyl tiles, recycled cardboard cellulose insulation, install Energy Star lighting and appliances and run a domestic hot water heater fired by natural gas, while recycling 80% of the on-site waste during construction. Their homes also have a high indoor air quality because they use low volatile organic compounds (VOC) carpets. Although Seattle's housing market is quite different from that of Pittsburgh's, it is worth noting that they can build a 12,000 sqft home for \$100,000, which includes the price of the land.

East Bay-Using the Power of the Sun

East Bay, California HFH decided to build "green" homes to combat global warming, reduce families dependence on fossil fuel energy and cut their net usage of electricity to zero. They focus on energy efficiency, sustainable material selection and indoor air quality. Their mission statement reads, "to create successful homeownership opportunities for families with limited incomes. We are a diverse community, building sustainable housing, helping to revitalize neighborhoods and fostering within everyone the conviction that housing is a fundamental right to be enjoyed by all."¹ East Bay HFH is currently building a green development of twenty-two homes on a two-acre site. One way these homes are resource efficient are that they take advantage of the natural light and heat from the sun. The windows are oriented towards the south allowing maximum natural daylighting. They also use photovoltaic cells to capture the

¹ EBH Fruitvale Green-Build Post Construction Summary 25 March 2004.

sun's energy and convert it to electricity, saving \$500 a year in electric bills. In thirty years because these homes do not rely on oil they will save 4,400lbs of CO₂ from being emitted into the atmosphere. The affiliate made a deal with the local PV retailer to buy the panels for the market price of \$4,000 so they pay for themselves in a few years. Besides helping to curb global warming and reducing families energy bills, East Bay is also helping to manage storm water by not tarring their driveway and instead making them permeable so that rainwater can soak through the ground and return to the groundwater supply. By framing on 24" rather than the traditional 16" on center they saved 30% lumber. The concrete used was also resource efficient because it used fly ash, a coal power plant byproduct, which reduces the cement content, whose production is energy intensive process. Whenever possible the concrete is stained to save flooring material. They use recycled carpet however they do not use recycled vinyl, because of the hazardous chemicals vinyl off gases in the production and destruction processes. Instead the siding is made of fiber cement, which is donated therefore making it actually no more expensive than building with vinyl. All the savings from the lumber are put towards purchasing the renewable resource, linoleum for kitchen and bathroom floors. Another sustainable decision East Bay made was creating a Green Team whose sole purpose is to research greener materials, construction techniques and design.

Tuscan-Renovating Old Housing Stock

Tucson, Arizona HFH's mission is to get families into affordable homes and keep them there. Tucson builds about one green home a year, however as

the housing stock is close to 50 years old, they are looking into doing renovations opposed to new construction, which is probably more resource efficient. They just recently built 36 homes in which there was one common play area for all the residents to share. These homes, including the land, cost anywhere from \$75,000-\$80,000 and are made of stick wood or steel framed stick and mud with an exterior stucco covering. They build with metal roofing because it lasts 50 years. They have also partnered with the University of Arizona architecture school to design and build a rammed earth and straw bale house.

El Paso-Energy Efficiency

El Paso, Texas HFH has been building passive solar homes since 1994. Part of the design incorporated roofing overhangs to allow winter natural heating and blocking of direct summer light. Homeowners are saving \$25 a month in utility bills while only adding \$5 a month to their mortgage payments.

Programmable thermostats, which automatically adjust temperature settings depending on if the homeowner is asleep or away, are installed. Another way they save energy is by installing ceiling fans in the bedroom, living and dining areas as well as using compact fluorescent light bulbs in the most frequently used fixtures. They also use white roofing shingles to reduce heat absorption.

Metro Denver-Material Reuse and Water Efficiency

Metro Denver, Colorado HFH incorporates green features in all of its housing. They use a solar water heating system, which provides 75% of the hot water needed. To be resource efficient they use recycled wood and plastic composites for decking. They also save water by installing low-flow faucets and

showerheads and water saving toilets, washing machines and dishwashers. Less water intensive plants are selected to save water as well. To improve indoor air quality low VOC paints are used. Lori Vaclavik, Metro Denver's Executive Director says, "by making minor changes in construction, families can save significant money through reduced utility bills. Habitat homes should not be affordable to purchase, but also affordable for a family to own and maintain. And it sets an important standard for all builders to follow."²

Austin Green Building Program-City Guidelines

Although the Austin Green Building Program is not a Habitat For Humanity affiliate, it should be mentioned for it is the first program to motivate a municipality to promote green building. Their reasons for building green are that the homes are of a better quality and they are cheaper. Some of their common practices that have not been mentioned above are planting trees that shade the house in the summer and keep wind away in the winter. Light-colored roofing materials are used to reflect the sun's heat. They build masonry walls because it stores a lot of heat but it changes temperature very slowly.

A Plan Of Action For Pittsburgh

1- Adopt the notion that environmentally sensitive homes are more socially responsible than conventional home building practices and rewrite bylaws to incorporate green criteria into mission statement. This is the first and

² <www.HFHI.org>

most fundamental step, without the other steps cannot be realized to their fullest potential.

2- Elect members of the Pittsburgh community to become part of the “Green Team”, which would be a group of skilled or interested individuals whose responsibility would be to meet monthly to discuss and research green strategies that Pittsburgh HFH could implement. Maybe even hire a green researcher to be a full-time staff member. Hire a construction manager that is not afraid to experiment with green materials. This idea is directly modeled on the East Bay HFH Green Team” where the construction manager, Dave Sylvester leads the committee.

3- Examine design configurations for climate and contextual issues. This might involve creating a book of house plans that are environmentally sensitive to the Pittsburgh area with the help of IBACOS and Hanson Design. IBACOS, researchers who increase the quality and performance of homes through best practice construction methods and Hanson Design, a local architecture firm are well versed in green design.

4- Apply for the Pittsburgh Federal Home Bank Loan, 10% of revenues go to affordable housing and the loan gives priority to green projects. Build to LEED Silver qualifications so that affiliate can be eligible for the Green Building Alliance’s Community Loan Fund. Encourage aluminum can

recycling to become eligible for the Aluminum Association's 2004 Cans for Habitat Grant Program. (See attachment)

5- Solicit donations from green building suppliers and stop accepting donated materials that degrade the environment such as vinyl flooring and siding.

6- Promote that affiliate is green through venues such as HFHI and Pittsburgh's HFH websites, local college chapters such as University of Pittsburgh and Carnegie Mellon University, local newspapers such as City Paper, Post-Gazette, Tribune, proponents of environmentally sensitive design such as Green Building Alliance and Global Green, and magazines such as Natural Home and Metropolis.

7- Pressure HFHI to give Pittsburgh HFH more money, support and publicity for going green. HFHI environmental initiative reads, "promoting cost-effective, best construction methods to its U.S. affiliates, raising awareness of the environmental impacts of house building."³ HFHI is not delivering this message from top down, therefore affiliates can settle for the status quo.

³ <www.habitat.org/env/environmental_initiative.aspx> 30 November 2005.

8- Develop a “Homeowners Guide To Living In A Green Home” in which all the benefits of a green home are outlined, including that the home is more valuable because of its high quality.

9- Educate potential Habitat homeowners about the environmental benefits of green homes. Give them tours of new Habitat green homes in the area.

Conclusion: Benefits For All

Building environmentally sensitive homes has many benefits for Pittsburgh’s HFH affiliate and for the homeowners. For one, they will be considered a high quality builder of affordable homes, which will not only give them good press but will also attract like minded individuals to work and volunteer for their cause. The local “green” designing and building communities will respect Habitat for Humanity. Not only will the homeowners benefit from lower utility bills and higher property value, but they will also enjoy the benefits of healthier indoor air quality, which means fewer days home from work and school and fewer doctor bills. With determination, Habitat for Humanity can improve the quality of Pittsburgh’s low income housing stock. My hope is that Pittsburgh HFH will embrace environmentally sensitive design and make a commitment to building every house from this point on with the most sustainable solution possible.

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