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Buffalo Habitat for Humanity: The Challenges and Prospects of Green Building

Abstract

Habitat for Humanity Buffalo has operated since 1985, and in that time has rehabilitated or built more than 150 homes in the cities of Buffalo and Lackawanna. An affiliate of Habitat for Humanity International (HFHI), Habitat builds affordable housing for qualified low-income people. Once approved, homeowners must put 500 hours of “sweat equity” into Habitat projects, including their homeowner education. In return, they receive a zero-interest mortgage, the proceeds of which pay their property taxes and homeowner’s insurance, as well as support the rehabilitation or construction of more Habitat homes in the Buffalo area.

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Buffalo, Housing/Neighborhoods, Green Housing, Report, Other, PDF

**BUFFALO HABITAT FOR HUMANITY:
THE CHALLENGES AND PROSPECTS OF GREEN BUILDING**

Martha R. McNeill
April 19, 2007

Affordable Housing and the Environment
Professor Sam Magavern

Providing Decent Housing for the Poor

Habitat for Humanity Buffalo has operated since 1985, and in that time has rehabilitated or built more than 150 homes in the cities of Buffalo and Lackawanna.¹ An affiliate of Habitat for Humanity International (HFHI), Habitat builds affordable housing for qualified low-income people. Once approved, homeowners must put 500 hours of “sweat equity” into Habitat projects, including their homeowner education. In return, they receive a zero-interest mortgage, the proceeds of which pay their property taxes and homeowner’s insurance, as well as support the rehabilitation or construction of more Habitat homes in the Buffalo area.

Habitat for Humanity International seeks to be a solution to the problem of poverty housing worldwide by providing simple, well-crafted, durable homes at the lowest cost possible. HFHI wants to ensure that their residents are able to afford their homes. The zero-interest mortgage is one element to that affordability. Beyond affordability in construction and mortgage payments, Habitat International promotes construction that supports its inhabitants in other ways:

Decent housing . . . doesn’t have leaks that can cause mold and rot, compromising both [the owner’s] health and home. Neither is decent housing full of toxic fumes, which can come from paint, carpet, and a host of other common . . . materials. A decent, affordable home is energy efficient, well ventilated, and comfortable; built from safe, health-preserving materials; and requires a minimum of upkeep or maintenance. It can be built from . . . materials that are sustainable, so we don’t further lay waste to our homeland. Building such a home isn’t impossible, but it does take careful planning.²

Building Green, Promoting Well-Being

HFHI’s concerns relate closely to those addressed by what has come to be known as green building: i.e., construction that is sensitive to the impact that buildings have on their environment and on the people in those environments. Of all sectors of the economy (industry,

transportation, and building), buildings (residential and commercial) account for the greatest energy consumption overall and the greatest carbon dioxide emissions. In the United States, buildings consume on an annual basis 76% of the electricity generated,³ 50% of all energy consumed,⁴ and generate approximately 700 million metric tons of carbon dioxide, nearly half the U.S. annual contribution⁵. (These figures include the energy expended in building operations as well as the “embodied energy” of the materials used to create buildings, i.e., the energy used in resource extraction, manufacture, and transportation.) In addition, buildings account for 40% of all raw materials used,⁶ 30% of waste output (136 million tons annually)⁷, and 12% of potable water consumption⁸.

As recent reports have indicated, global climate change as a result of greenhouse gas emissions has created and will continue to create hazards for the global community.⁹ Many of these effects fall disproportionately on the poorest peoples:

In almost every instance, the people most at risk from climate change live in countries that have contributed the least to the atmospheric buildup of carbon dioxide and other greenhouse gases linked to the recent warming of the planet. Those most vulnerable countries also tend to be the poorest. And the countries that face the least harm — and that are best equipped to deal with the harm they do face — tend to be the richest.¹⁰

Both governmental and non-governmental bodies must work to mitigate the inevitable problems resulting from the climate change as well as develop adaptive mechanisms to best accommodate the changed conditions. Among those efforts are developing and using appropriate land-use and building codes and more benign energy sources.

The green building movement has sought to address the environmental challenges posed by buildings, as well as the need to conserve energy and develop alternative energy sources.

Although there is no universal agreement on all the appropriate elements of green design and their relative importance, the United States Green Building Council (USGBC) currently sets the standard for environmentally sensitive building, especially as embodied in its Leadership in Energy and Environmental Design (LEED®) rating system.¹²

Established in 1993, the USGBC has sought to provide coherence and direction to the green building movement.¹³ The USGBC is composed of architecture firms, engineering firms, builders, manufacturers, service contractors, government entities (federal, state, and local), real estate developers and owners, financial institutions, universities, retail companies, nonprofit associations, utilities, and others. Its membership now totals more than 7200 and includes 80 regional chapters. USGBC's influence may be seen in the fact that between 2000 and 2005, more than 289 projects received LEED certification and more than 2069 projects were registered with LEED in 50 states and 13 countries.¹⁴ Since its inception, USGBC has focused on large building construction and rehabilitation, but it has recently begun piloting a LEED rating system for individual homes.¹⁵

USGBC's green design standards for homes cover five main areas:

- **Sustainable site planning:** This element focuses on stewardship of land and minimizing the ill-effects of construction. Included are site selection to avoid environmentally sensitive areas and farmland. Incentives are provided to locate a home in a previously developed area and to encourage location within a half mile of existing water and sewer lines and close to public transportation and green space.
- **Efficient use and care of water:** Promotes use of design elements that collect and filter rainwater, diverting it from storm sewers, and landscaping that reduces

water use. High or very high efficiency fixtures, graywater systems, and other innovative wastewater technologies can receive LEED credits.

- **Conservation of materials and resources used in construction:** Promotes the use of building materials that have a high percentage of recycled content, and encourages the use of locally manufactured materials. USGBC also encourages the re-use of portions of the existing building on a site, as well as the recycling of construction waste. Framing techniques that minimize waste are also promoted.
- **Indoor environmental quality:** Recognizing that human health and well-being are affected by such things as indoor air quality, USGBC has established minimum indoor air quality standards, using the Energy Star indoor air standard as the goal.¹⁶ LEED also promotes the use of low-emitting materials (in paints, carpets, composites, etc.), use of daylighting, frequent fresh-air exchange, and methods to abate radon.
- **Energy and Atmosphere:** USGBC requires what it terms the “fundamental commissioning” of the building’s energy systems. The energy systems subject to required commissioning include heating, ventilation, and cooling (including refrigeration); insulation; windows; lighting and daylighting controls; hot water systems; and renewable energy systems. This entails third-party verification that the energy systems have been installed and calibrated and are operating in accordance with the design plan. In addition, a minimum energy performance level is required, as well as strict management of all refrigerants. For the pilot LEED Homes system, meeting the Energy Star standard is a prerequisite, and the goal is to exceed that standard. (The Energy Star standard is an energy system that is at least 15% more

efficient than that established by the 2004 International Residential Code.¹⁷⁾ In addition, LEED for homes includes requirements for builder education, homeowner education, and public education about affordable green homes.

A Greener Habitat for Humanity International

Habitat for Humanity's long-term focus on decent, durable, affordable housing for the poor leads naturally to an affinity for environmentally sensitive design and construction.

Habitat's Environmental Initiative promotes cost-effective, best-practice construction methods to its U.S. affiliates, raising awareness of the environmental impacts of house building. As a result, partner families may enjoy healthier, more energy-efficient and durable housing at the lowest possible cost. Over time the initiative has been integrated into Habitat's standard education and training activities, so that affiliates are encouraged to be good house builders and good stewards of natural resources.¹⁸⁾

Through its Better Built Program, HFHI's Construction and Environmental Resources Department (CAER) offers its affiliates assistance that is keyed to their area of the country to improve the energy efficiency and environmental sensitivity of building practices.¹⁹⁾ Affiliates need to ask for the assistance, however, and some are not even aware of it. CAER partners with the U.S. Department of Housing and Urban Development, Environmental Protection Agency, and the Department of Energy's Building America Program and Energy Star Program to provide HFHI affiliates with vital technical information. HFHI has adopted the most recent version of Energy Star as an HFHI "best practice."²⁰⁾ And in league with the Southface Energy Institute, CAER strives to link its affiliates to the most up-to-date technical information on energy efficiency.²¹⁾ HFHI has also recently partnered with USGBC in piloting the LEED for Homes rating system, with the New York City and Philadelphia affiliates taking part.²²⁾

In addition to urging energy efficiency, HFHI encourages materials conservation, in large measure by restricting the size of its homes.²³ For example, a four-bedroom house should be no more than 1150 square feet, about half the size of a typical new home. In the LEED for Homes system, this would garner a HFH home a significant number of points toward certification.²⁴ CAER also advocates materials conservation by promoting Optimal Value Engineering (OVE) as well as materials recycling and reuse.²⁵ OVE techniques help to reduce the amount of material needed for construction and to use that material more efficiently, such as framing in ways that also permit a substantial increase in the amount of insulation.²⁶ One of HFHI's more recent innovations is the ReStore model, in which local affiliates receive donated household and construction items for resale, helping to both fund local HFH programs and reduce the flow of material into the waste stream.²⁷ Some ReStores have spurred the growth of HFH deconstruction teams, such as in Austin, Texas, and in Raleigh, North Carolina, that salvage reusable building materials ranging from hardwood floors to wood framing.²⁸

In with the tradition of systems such as Energy Star and LEED, CAER also promotes safe and healthy housing.²⁹ CAER urges affiliates to use materials such as low volatile organic compound (VOC) paints, carpet made from recycled plastic containers, and Oriented Strand Board, all of which reduce or eliminate the hazards of off-gassing associated with compounds such as formaldehyde. Ventilation by appropriately placed and properly-sized exhaust fans addresses the need for fresh air to compensate for more tightly constructed buildings and the concomitant propensity for higher humidity levels (which can provide a habitat for insects, mold, mildew, and bacteria). Given that HFH rehabilitates many older homes, CAER offers checklists and training videos on the proper removal and disposal of building materials containing lead.³⁰

Buffalo Habitat for Humanity's Current Programs and Practices

What practices does Buffalo HFH currently employ that can be considered “green” building? What other green practices should and could Buffalo HFH adopt that would promote their overall quest to provide decent affordable housing? Examining the experience of affiliates that are intentionally adopting green practices, what advantages are offered by an intentional approach, both to the homeowner and to the affiliate? What partnerships and resources, including those with and from government, might enhance Buffalo HFH’s mission?

Buffalo HFH currently rehabilitates or builds approximately 16 houses per year, with four construction teams working four days per week.³¹ Because of this volume of completed housing, Buffalo HFH is considered to be one of the largest HFH affiliates.³² Seventy-five percent of their efforts go toward rehabilitation, with vacant properties purchased from the City of Buffalo for \$1. Buffalo HFH President Ronald Talboys and Construction Manager, Don Marx, highlight their affiliate’s focus on building affordable housing. Buffalo HFH’s prefers rehabilitation over construction because of the availability of vacant property in the Buffalo area and the reduced costs in rehabilitation: \$20-25/square foot versus more than double that amount for a new build. Mr. Talboys also notes that a rehabilitation tends to offer tasks that suit volunteers with a wide range of skill levels. Buffalo’s housing stock includes many solidly built homes that are good candidates for rehabilitation. Volunteers also may appreciate saving an older home from demolition.

Often new builds are done as in-fills on lots where the city has demolished a home. Although it costs about \$80,000 to build a new home, a new build often attracts positive publicity, new donors and new volunteers, as well as generates new life in the neighborhood.

Construction and rehabilitation at Buffalo HFH are guided by HFHI's Affiliate Operations Manual, which provides basic criteria and guidelines. The fact that HFHI encourages the restriction of square footage as far as possible to 900 square feet for a two-bedroom home, 1050 square feet for a three-bedroom home, and 1150 square feet for a four-bedroom house, means that, compared to typical home rehabilitation and construction, HFH homes promote materials and energy conservation. Although neither Mr. Talboys nor Mr. Marx specifically acknowledges a "green" focus in their building, they said that the affiliate strives to construct its homes affordably and in such a way that the homeowners can successfully maintain the homes. Among those considerations is energy efficiency, met by increasing insulation (to R19 in walls and R-38 in roofs), replacing windows with thermopane (dual-paned) varieties, and installing high-efficiency (90%) gas furnaces.

Buffalo HFH makes use of Whirlpool Corporation's donation of Energy-Star rated kitchen ranges and refrigerators to all HFH projects nationwide. Much of the drywall used is donated by a local company that tests drywall for flammability. Occasionally other materials are donated (such as cabinets, light fixtures, etc.). Vinyl siding is standard for their buildings (unless existing siding is in good shape), as well as asphalt roofing. Vinyl flooring is the standard for kitchens and baths, and the rest of the house is carpeted. Compact fluorescent lights are used, although not exclusively. Aside from rough grading and grass seeding, landscaping typically is not included as part of a project. Nearly \$800,000 of Buffalo HFH's annual budget is spent on materials.

One reason that Buffalo HFH replaces windows is to deal with the problem of lead paint in its rehabilitation projects. This has particular importance in the Buffalo area, where the age of the housing stock means that lead is a common problem. New energy efficient windows also help reduce the level of indoor condensation, reducing the likelihood of the growth of mold and thus enhancing indoor air quality. But indoor air quality can be compromised by the other energy efficient features in the home, such as high-efficiency furnaces and high levels of insulation and sealing. Currently, Buffalo HFH includes exhaust fans in both the bathroom and the kitchen. These are typical in many homes, and in the small homes that Buffalo HFH builds may provide sufficient ventilation, so long as they are properly sized.

A critical element in materials conservation is the appropriate recycling and removal of waste. Buffalo HFH had at one time relied on its volunteers to take construction waste in their personal vans to the dump. In recent years, Waste Management has provided a waste removal truck and driver free of charge to Buffalo HFH sites. In addition, the City of Buffalo waives its tipping charges for Buffalo HFH. As Mr. Talboys noted, Buffalo HFH is then free to focus on rehabilitation and construction, and not on salvage or removal.

Buffalo HFH is not interested at this time in salvaging much of the materials it removes from its rehabilitation sites. Molding is reused when possible, and old windows and doors may be sold at the recently opened Buffalo ReStore. Concrete is recycled, but for the most part Buffalo HFH wishes to concentrate its efforts on construction over salvage.

Buffalo HFH gets assistance each May from construction teams from the University at Buffalo's School of Architecture. Teams spend about two weeks putting in foundations for new construction and framing the homes.

To fund its projects, Buffalo HFH relies primarily on individual donations and sponsorship of buildings (usually by churches or groups of churches). Ninety-cents out of every dollar goes directly to building.³³ This high rate is largely due to the fact that Buffalo HFH is volunteer-run (the only paid staff are four part-time construction supervisors). The recently opened ReStore will likely add much needed funds. Buffalo HFH has used New York State's Weatherization Program to support insulation measures, but otherwise has not relied on government-funds, in keeping with what has been traditional HFH practice.³⁴ Buffalo HFH has recently been awarded \$73,000 from the Federal Home Loan Bank toward the rehabilitation of 10 homes.³⁵ In an April 18, 2007, email, Mr. Talboys indicated that Buffalo HFH may be willing to explore other government-sponsored funds, so long as they do not include measures that conflict with the religious foundations of the HFH program.³⁶ Buffalo HFH seeks to adhere to the guidance of HFHI that no more than 30% of an affiliate's budget should come from one funding stream.³⁷

Habitat for Humanity Affiliates Go Green

Some HFH affiliates have taken a lead in developing and incorporating energy efficient and environmentally conscientious constructions practices in its homes. Innovative partnerships often have helped to spur this innovation.

Denver, Colorado, HFH

Since building its first “green” home in 1997, Denver HFH in Colorado has incorporated similar green building practices in all its homes. Aside from more typical energy efficiency features such as enhanced wall and ceiling insulation, Denver HFH has used both passive and active solar design. Installing four large, well-insulated south-facing windows and a solar hot water system reduces the homes’ energy use and means that heating can be provided by a smaller as well as more efficient furnace.³⁸ The HFHI Affiliate Operations Manual also highlights Denver’s program, noting that “[t]he homeowners only paid \$45 for their highest utility bill for the 1997-98 winter.”

El Paso, Texas, HFH

El Paso HFH has used passive solar in its homes since 1994, placing large window areas on the south side, and reducing or eliminating window area on the east, west, and north sides of its homes. By also incorporating ceramic tile throughout their homes, thermal mass is enhanced, increasing the effectiveness of passive solar heat gain. For a \$5 per month increase in mortgage payments to cover the additional costs of these features, the homeowners save about \$25 per month in energy costs.³⁹

Capital District HFH, Albany, NY

Over the last four years, the CD-HFH has built homes in accordance with New York State's Energy Smart program, funded by the New York State Energy Research and Development Authority. NYSERDA also helped fund CD-HFH's installation of a full solar electric system in one of its homes, which will reduce the homeowner's energy costs by more than 50%.⁴⁰

Flower City HFH, Rochester, NY

In 2003, Flower City HFH built its first Energy Star-rated home, which involved an independent rater to assess the furnace, hot water heater, percentage of compact fluorescent lighting, sealing of the building envelope and the like prior to drywalling.⁴¹ The Energy Star-rated home also garnered financial support through NYSERDA's Energy Smart program.

Beginning in 2005, the Rochester chapters of the American Institute of Architects and of the American Council of Engineering Companies collaborated in the sponsorship, design, and build of an HFH home, and are exploring a second such project for which they may seek LEED for Homes certification.⁴²

FC-HFH has recently piloted a program of the Institute for Classical Architecture for the design of a new home within a historical preservation district.⁴³ While not an officially "green" home, the project is notable for its attention to the challenge of making infill projects that fit their surroundings, supporting the creation of an aesthetically cohesive community while at the same time promoting durability and affordability. The final cost, however, was \$90,000, about \$10,000 over a typical new build in upstate New York. The project was prohibited from using vinyl siding, for example, in favor of fiber-cement siding, which is both more durable than vinyl,

and more like wood. Fiber-cement siding is highlighted in HFHI's Green Building Products Matrix.⁴⁴ In addition to its durability and wood-like appearance, it is recycled material, and provides superior protection against moisture and insect infestation. It is also non-combustible, which may help reduce homeowner's insurance rates.⁴⁵ Bill Bartlett of FC-HFH found that although fiber-cement siding cost about 15-20% more than vinyl, it was easier for the volunteers to install and mistakes were easier to correct. The material is pre-primed, and holds a coat of paint for about 15 years. Warranties can last 50 years.

Washington Co. HFH, Fayetteville, Arkansas

An exciting collaboration between the University of Arkansas and Washington Co. HFH has received the support of the Environmental Protection Agency in a grant of \$464,000 awarded by the Arkansas Natural Resources Commission. The award supports the development of a neighborhood that will set new standards for green building in Arkansas. A major focus will be creating sustainable storm water management systems by the use of bioswales and riparian greenways as part of a fully integrated neighborhood system to reduce non-point source pollution. In addition, the plan includes environmentally-friendly high-density housing, and a pedestrian friendly mixed-use street designed as a public garden.⁴⁶

Copper Country HFH, Houghton, Michigan

The Upper Peninsula of Michigan, where winters are very cold and snowy, has seen innovations in high energy efficiency housing through Copper Country HFH. Since 1999, CC-HFH has built single-story, 1065 square-foot woodframe homes for about \$35 to \$39 per square foot. Because of the very high insulation levels (including R60 in the ceiling) winter heating bills run about \$30 per month. Instead of a furnace, hot-water radiators are used, along with a heat recovery ventilation system. Frost-protected shallow foundations are used, which significantly

reduce energy loss: the system allows for both vertical and horizontal insulation to trap heat in the ground around a home.⁴⁷

How Buffalo HFH can Green its Building

Buffalo HFH serves a community that is not lacking in housing stock, but is lacking in high-quality affordable housing. It also serves a community suffering from ills similar to those in many older communities—decaying housing stock, deteriorating neighborhoods, and compromised health of its citizens because of lead, asbestos, and problems related to moisture-ridden homes. Buffalo HFH also has the experience, skill, and above all dedication with which to address these ills.

Buffalo HFH's current practices include many that support high levels of energy efficiency. Given that it is volunteer-run, unlike affiliates in places such as Rochester and Albany, it lacks the full-time staff that can spend time researching best practices and new funding opportunities. On the other hand, there are resources in the community and beyond that can help Buffalo HFH improve its building practices to support its mission of bringing the best possible housing to the greatest number of vulnerable residents.

1. Seek new partnerships

a. Explore a challenge to the UB School of Architecture students to design the greenest possible new home or rehabilitation for Buffalo HFH. Dennis Andrejko, professor at the School, would be interested in pursuing such a project. He may be contacted at Andrejko@buffalo.edu, or at 829-3483 x105.

b. Consider a partnership with (or a challenge to) the local chapter of the American Institute of Architects. The Western NY contact is G. Richmond of Cannon Design, 2170

Whitehaven Road, Grand Island, NY 14072 Phone: (716) 774-3425,
grichmond@cannondesign.com.

c. Walter Simpson, who is the Energy Officer for the University at Buffalo, has used his home as a laboratory for energy-saving and other environmentally friendly renovations. He would be pleased to discuss his experience and explore options with Buffalo HFH. He may be contacted at 829-2515, wsimpson@facilities.buffalo.edu.

2. Explore government funds that promote energy efficiency, green building, and affordable housing. These funds can either go directly to support the use of new technologies or to support the building generally, freeing up Buffalo HFH's funds to incorporate newer energy systems or other green features.

a. Explore NYSERDA's Energy Smart program, which provides funds for such items as photovoltaic solar panels. The Capital District HFH used this program in some of its projects.

b. New York City's HFH has received funding through the New York State Affordable Housing Corporation's Affordable Home Ownership Development Program.⁴⁸ Erie County is on the list of those eligible to apply for these funds.

3. Explore the use of other affordable items on HFHI's Green Matrix, in addition to those you are already using.

a. Low VOC paints—one provider, Valspar, is in partnership with HFHI, and has donated paints to several HFH affiliates (e.g., Milwaukee HFH, Nashville (TN) HFH, Minnesota HFH). Local distributors include Lowe's as well as independent hardware stores (see <http://www.valspar.com/products/dealer-locator.html>).

b. Elimination of wall-to-wall carpeting and vinyl in favor of hard flooring, such as parquet or laminate, to reduce off-gassing and promote healthier indoor air quality. (Or, select recycled carpet.)

c. Use urea-formaldehyde-free plywood, such as Oriented Strand Board.

d. Explore the use of Insulated Concrete Forms, which are light, energy efficient, and offer a reduction in construction steps. (Contact Jennifer Langton at HFHI or Klamath Basin HFH in Oregon for information on HFHI's partnership with the supplier, American Polysteel.)

4. Intentionally promote both current and prospective green efforts as a way to increase public exposure of HFH to a more environmentally aware community, including local green businesses. Having an Energy Star-rated project, for example, can spur both current volunteers and attract new volunteers and donors. (HFHI materials on the Energy Star program are attached.)

5. Examine the experience other HFH affiliates have had with reuse of building materials and the sale of recovered building materials in its ReStores.

6. Participate with Buffalo ReUse in devising innovative materials recovery. Consider allowing ReUse to volunteer in deconstructing a rehabilitation site, or evaluate the deconstruction potential of a rehabilitation site. Michael Gainer, Executive Director, may be contacted at Buffalo ReUse Inc., P.O. Box 1132, Buffalo NY 14213, 885-4131, info@buffaloreuse.org, www.buffaloreuse.org.

7. By adopting greater energy, water, and materials efficiencies that reduce life-cycle costs of rehabilitation and construction, Buffalo HFH could reduce the income eligibility limits for its homeowners, increasing access to HFH homes.

Conclusion

By incorporating the most energy efficient and environmentally appropriate building practices, Buffalo HFH can enhance and extend its primary mission of ending poverty-level housing. By creating healthier neighborhoods that have a lighter impact on the environment, it will promote a healthier community and potentially reduce the harm experienced by more vulnerable neighbors beyond our own borders.

¹ Buffalo Habitat for Humanity, About Us: How We Work and Fact Sheet, *available at* http://www.habitatbuffalo.org/index.php?option=com_content&task=category§ionid=5&id=14&Itemid=30.

² LARRY HAUN, HABITAT FOR HUMANITY: HOW TO BUILD A HOUSE 3 (Taunton Press 2002).

³ Figure 2.1b, Energy Consumption by End-use Sector, 1949-2005, Annual Energy Review 2005, U.S. Energy Information Administration, *available at* http://www.eia.doe.gov/emeu/aer/pdf/pages/sec2_3.pdf.

⁴ Figure 2.1a, Energy Consumption by Sector Overview, End-use Sector Shares of Total Consumption, 2005, Annual Energy Review 2005, U.S. Energy Information Administration, *available at* http://www.eia.doe.gov/emeu/aer/pdf/pages/sec2_2.pdf.

⁵ U.S. Energy Information Administration, as graphed by Architecture 2030, *available at* http://www.architecture2030.org/building_sector/index.html. By contrast, transportation contributes approximately 500 million metric tons of CO₂/year, and industry 300 million metric tons.

⁶ Lenssen and Roodman, 1995, “Worldwatch Paper 124: A Building Revolution: How Ecology and Health Concerns are Transforming Construction,” Worldwatch Institute.

⁷ U.S. EPA, 1998, “Characterization of Building-Related Construction and Demolition Debris in the United States,” *available at* www.epa.gov/epaoswer/hazwaste/sqg/c&d-rpt.pdf.

⁸ U.S. Geological Service, 1995 data, as noted by Architecture 2030, *available at* http://www.architecture2030.org/building_sector/index.html.

⁹ See, e.g., United Kingdom, The Stern Review: The Economics of Climate Change, October 30, 2006, *available at* http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm; The Intergovernmental Panel on Climate Change, Fourth Assessment Report, “Climate Change 2007,” February 12, 2007, *available at* <http://www.ipcc.ch/>.

¹⁰ Andrew C. Revkin, *Reports from Four Fronts in the War on Warming*, N.Y. TIMES, April 3, 2007, *available at* <http://www.nytimes.com/2007/04/03/science/earth/03clim.html?em&ex=1175745600&en=61f7d184caba354d&ei=5070>.

¹¹ The Stern Review: The Economics of Climate Change, Policy Responses for Adaptation, Part V, p. 436, *supra* n. 9.

¹² See “USGBC Accredited as ANSI Standards Developer,” Nov. 27, 2006, *available at* <http://www.usgbc.org/News/PressReleaseDetails.aspx?ID=2764>. See also “GSA Says LEED Most Credible Green Building Rating System,” Sept. 27, 2006, *available at* <http://www.usgbc.org/News/USGBCInTheNewsDetails.aspx?ID=2628>. See also http://www.nyserda.org/programs/Green_Buildings/default.asp#CaseStudies.

¹³ See www.usgbc.org. The USGBC’s regional chapters include the Upstate New York Chapter: see www.greenupstateny.org.

¹⁴ See “An Introduction to the U.S. Green Building Council and the LEED Green Building Rating System,” slide 15, *available at* <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=75&#ppt>.

¹⁵ LEED for Homes, 1.11a, January 26, 2007, *available at* www.usgbc.org.

¹⁶ Department of Energy, A New Energy Star® Home Improves our Environment, *available at* http://www.energystar.gov/index.cfm?c=new_homes.nh_features.

¹⁷ See *What is IRC?* *Available at* http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_IRC.

¹⁸ See Habitat for Humanity Int’l, Construction and Environmental Resources, Environmental Initiative, *available at* http://www.habitat.org/env/environmental_initiative.aspx.

¹⁹ See Habitat for Humanity International, Better Built Program, *available at* http://www.habitat.org/env/better_built.aspx.

²⁰ See The New Energy Star® Standard is a Habitat for Humanity Best Practice, *available at* http://www.habitat.org/env/energy_bulletins.aspx.

²¹ See Habitat for Humanity International, Construction and Environmental Resources, Internet Resources: Energy Bulletins, Energy Star, and Renovations, *available at* http://www.habitat.org/env/energy_bulletins.aspx.

²² Phone call with Jennifer Langton, Environmental Resources Specialist, HFHI Construction and Environmental Resources Department, March 26, 2007. Habitat for Humanity in Brooklyn, NY, is one affiliate that is piloting the LEED for Homes system. See also, Michael J. Crosbie, *Home is Where the Green Is*, AIARCHITECT THIS WEEK, March 23, 2007, *available at* http://www.aia.org/aiarchitect/thisweek07/0323/0323rc_face.cfm (describing LEED for Homes and HFH-New York City’s pilot of the system in a Brooklyn apartment complex); and Joe McNulty, *Habitat Philadelphia to Join Green Building Campaign*, *available at* http://www.habitatphiladelphia.org/about_us/news.php?ID=50.

²³ HFHI Affiliate Construction Manual, Ch. 3, 1. [provided by Buffalo HFH Construction Manager, Don Marx].

²⁴ LEED for Homes, 1.11a, *supra* n. 15, at 23. The threshold point level for certification would be reduced by 10 points (i.e., instead of needing 45 points in all areas to reach the lowest, certified level, 35 points would be required).

²⁵ See HFHI Construction and Environmental, Materials Conservation, *available at* http://www.habitat.org/env/materials_conservation.aspx.

²⁶ See Jeannie Leggett Sikora, National Assoc. of Home Builders Research Center, PROFIT FROM BUILDING GREEN 14-15 (2002).

²⁷ Material Conservation, *supra* n. 25.

²⁸ Rebekah Daniel, *Re-Store-Ing Revenue: Habitat ReStores’ Environmental and Fund-raising Roles Enable Supporters to Shop with a Purpose*, HABITAT WORLD, September 2006, *available at*

<http://www.habitat.org/hw/sept2006/feature9.html>. The Austin, TX, affiliate claims that up to 80% of a building can be reused or recycled. *Id.*

²⁹ Habitat for Humanity, Construction and Environmental Resources, Building Healthy Indoor Air Quality into Habitat Homes: IAQ Tips for Affiliates [provided by Jennifer Langton, Environmental Resources Specialist, HFHI Construction and Environmental Resources Department].

³⁰ Habitat for Humanity, Construction and Environmental Resources Lead-safe Construction Practices During Renovation, *available at* http://www.habitat.org/env/safe_healthy_housing.aspx.

³¹ Phone interview with Ronald Talboys, President, Buffalo HFH, March 5, 2007. Mr. Talboys has served as president of Buffalo HFH since 1985. Further information in this section is drawn from an interview with Mr. Marx on March 28, 2007, at the site of a Buffalo HFH rehabilitation project on LaSalle Avenue, Buffalo, NY, and from subsequent emails with both Mr. Talboys and Mr. Marx.

³² Buffalo HFH Fact Sheet, *supra* n. 1. “Built 25th home in 1994, 50th home in 1998, 75th home in 2000, 100th home in 2002, 150th home in 2005.”

³³ *Id.* Paid staff information from interview with Don Marx, *supra* n. 31.

³⁴ “Government funds are not accepted for new construction or renovation or repair of existing houses. We do accept government funds for acquisition of land or houses in need of rehabilitation. We also accept government funds for streets, utilities, and administrative expenses, as long as the funds have no strings attached that would violate Habitat Buffalo’s principles.” Buffalo Habitat for Humanity, About Us: How We Work and Fact Sheet, *available at* http://www.habitatbuffalo.org/index.php?option=com_content&task=category§ionid=5&id=14&Itemid=30.

³⁵ *See* Federal Home Loan Bank, Affordable Housing Program Awardees, *available at* <http://www.fhlbny.com/community/ahp/ahpaward107.htm>. The AHP is a project that enables member banks to fulfill its obligations under the Community Reinvestment Bank by sponsoring applicants for grants to produce affordable housing. M&T Bank is Buffalo HFH’s sponsor.

³⁶ Email from Ronald Talboys to Martha McNeill, April 18, 2007.

³⁷ *Id.*

³⁸ Habitat for Humanity, Denver’s “Green” Program, *available at* http://www.habitat.org/env/denver_project.aspx.

³⁹ Energy Efficient Homes: Habitat for Humanity of El Paso, *available at* http://www.habitat.org/env/el_paso_project.aspx.

⁴⁰ Capital District Habitat for Humanity, 2006 Annual Report, at 3, *available at* <http://capitaldistricthabitat.org/2006report.pdf>. Suffolk, NY, HFH, has also built a home including solar panels. *See* HFH Suffolk Builds First Solar Home, *available at* http://www.habitat.org/cd/local/affiliate_detail.aspx?field=433.

⁴¹ Phone call with Bill Bartlett, Flower City HFH Construction Manager, April 16, 2007.

⁴² *Id.* Also, emails from Linda Hewitt, Rochester AIA, and Don Turner, Rochester ACEC, April 16, 2007.

⁴³ *See*, e.g., Institute of Classical Architecture and Classical America, ICA&CA/Habitat for Humanity Partnership Completes First House, *available at* <http://www.classicist.org/habitat.html>.

⁴⁴ Provided by Jennifer Langton, Environmental Resources Specialist, HFHI Construction and Environmental Resources Department. [I provided a copy to Don Marx on March 28, 2007.]

⁴⁵ Colleen Hanson, Lowe's for Pros, As siding options grow, keep yourself—and clients—informed about the latest trends and technology, *available at* <http://forpros.lowes.com/articles.cfm?aid=36>.

⁴⁶ U.S. States News, *EPA Grant of \$464,000 to University at Arkansas Community Design Center, Division of Agriculture to Fund Sustainable Housing in Fayetteville*, March 26, 2007, *available at* <http://www.innovations.harvard.edu/news/19361.html>.

⁴⁷ *See, e.g.,* Copper Country HFH Specifications for New Homes, *available at* <http://www.coppercountryh4h.org/specs.htm>.

⁴⁸ *See* New York State Affordable Housing Corporation, *Get a Grant from AHC*, *available at* <http://www.nyhomes.org/home/index.asp?page=55>. *See also,* Grantee List, *available at* <http://www.nyhomes.org/home/index.asp?page=98#2>.