

**PUSH Buffalo's Community Housing Co-operative:
A Case Study in Green Building Rehabilitation**

Mary O'Donnell
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Between March 2006 and March 2007, a group of community organizers at People United for Sustainable Housing (PUSH) used green building methods to create affordable, safe, and sustainable housing by rehabilitating a formerly abandoned four unit building on Buffalo's West Side. Organizations and agencies involved in affordable housing can learn from PUSH's example and should replicate or support similar projects because greener and more affordable housing will benefit the community, the residents, the environment, as well as Buffalo as a whole.

I. Background: PUSH's Plan

Buffalo's West Side is experiencing an increase in abandoned homes, a problem that faces many neighborhoods throughout Buffalo and its inner ring suburbs.

Abandonment is the result of a multitude of factors, including:

- white flight
- urban sprawl
- Buffalo's weakened economy
- a lack of employment opportunities for residents
- absentee landlords
- predatory lending practices
- a high number of home foreclosures due to owners who can no longer afford to pay taxes or utilities

- instances in which banks force residents out but do not officially foreclose on properties
- a high number of homes that have been foreclosed on but now sit in limbo because the high cost of repairing these homes constitutes more money than they are worth. Many of these houses become blighted, leading to condemnation and to eventual demolition.

Unfortunately, there are now more abandoned houses in Buffalo than the City can keep up with, which results in neighborhoods with an increasing number of abandoned homes that attract rats, drug use, vagrants, theft, and deterioration. In 2000, approximately 22,854 or 15.7% of all housing units in Buffalo were either vacant or abandoned.¹ Many of these homes create hazards for neighboring residents, especially children, due to structural instability and the potential presence of toxins such as lead, asbestos, and mold.

In 2005, the community organizers of PUSH Buffalo began to work with residents of Buffalo's West Side neighborhood to combat the forces contributing to abandonment and the poor quality of existing affordable housing. Though there is plenty of housing available in Buffalo, there is a dearth of housing that is both affordable and safe. HUD defines housing costs as "affordable" if they comprise 30% or less of a resident's income. According to census data from the year 2005, 26.9% of all Buffalo residents live in poverty. The US Department of Health and Human Services calculates that a family of four in 2006 is living below the poverty line if the family income is less

¹ Buffalo's Comprehensive Plan, *Queen City in the 21st Century*, October 2004, page 24.

than 20,000 dollars.³ Affordable housing costs for such a family would be no more than \$6,000 a year, or \$500 per month.

While Buffalo does have a lot of inexpensive housing available, it is not of good quality – a substantial portion of Buffalo’s housing stock is in poor condition.⁴ Furthermore, because of the poor condition of the housing, the local climate, and high energy prices, utility bills are high. One solution utilized by PUSH is to purchase and rehabilitate an existing abandoned building and rent it out as affordable, safe, cooperative and sustainable housing for neighborhood residents.

People living in the PUSH housing cooperative also participate in a program that sets aside a portion of each month’s rent, the total of which can be matched by federal funds and put towards home ownership at the conclusion of two years. This program adds an extra benefit to the neighborhood by increasing homeownership and the number of people re-investing in the area.

Green building methods like those used by PUSH complement affordable housing by allowing housing to become more affordable for tenants and landlords, while also making homes healthier and more environmentally sustainable. On average, Americans spent \$1,500 annually on utility costs.⁵ Buffalo’s long, cold winters contribute to that cost being higher for City residents. Buffalo’s older, less insulated housing stock is another cause of this phenomenon. More than half of the homes in Buffalo (58% or approximately 84,000 units) were built prior to 1940.⁶ By increasing energy efficiency and conserving resources, people can save between 10 to 90 percent of annual utility

³ Health and Human Services website: <http://aspe.hhs.gov/poverty/06computations.shtml>

⁴ Buffalo’s Comprehensive Plan, *Queen City in the 21st Century*, October 2004, page 23.

⁵ Rocky Mountain Institute, “Energy Efficiency: First Things First” at <http://www.rmi.org/sitepages/pid195.php>

⁶ Buffalo Comprehensive Plan, page 24.

costs, depending on extent of conservation efforts.⁷ The US Department of Energy estimates that by adding basement wall insulation to a home in Buffalo, a user will save approximately \$390 per year.⁸ Using an energy efficient refrigerator can reduce electricity bills by 10 percent.⁹ The annual savings incurred through energy efficient design and practices can amount to a substantial portion of a low income person's total income. This benefit is even greater for residents of affordable housing, because the residents realize the savings of energy efficiency without the upfront investment costs.

The environmental benefits of green building are tremendous. One third of all energy consumed in the United States is used by buildings. Buildings are responsible for producing 35 percent of the carbon dioxide emissions in the US,¹⁰ compared to the 27 percent contributed due to transportation in 2003.¹¹ In the City of Buffalo, residential energy uses account for 34 percent of greenhouse gas contributions in 1996, compared to 14% contributed by vehicle use.¹² Green design allows residents and landlords to utilize efficient energy consumption and save on utility costs while conserving natural resources.

In addition to green design benefits, the preservation and rehabilitation of existing housing is in itself more energy efficient and environmentally friendly than demolition and rebuilding. It is estimated that 40% of all raw materials extracted each year are used for building materials.¹³ By re-using an existing building, a developer can reduce both the materials used and the energy expended to complete a project. Renovating an existing structure also saves a greenfield from becoming developed.

⁷ Rocky Mountain Institute, "Energy Efficiency: First Things First"

⁸ US Department of Energy at

http://www.eere.energy.gov/consumer/your_home/insulation_airsealing/index.cfm/mytopic=11470

⁹ Global Green USA, Global Green 101 "Top 20 No- or Low Cost Green Building Strategies"

¹⁰ USDOE

¹¹ US Environmental Protection Agency at <http://www.epa.gov/otaq/climate/420r06003summary.htm>.

¹² Buffalo Comprehensive Plan, Page 40.

¹³ Simpson, Walter. *A Facilities Manager's Guide to Green Building Design*.

Green building and renovation also include a number of less easily quantifiable benefits, including happier, healthier residents and a healthier planet. These benefits also include fewer risks to health and welfare from risks such as lead, mold, dust and asbestos. Indoor air quality is important because people spend more time indoors than outdoors. Children are particularly at risk for asthma and lead poisoning. Indoor air pollutants may cause and can trigger asthma, a growing concern for urban children. More than 6.3 American children have asthma. Children who are lead poisoned are more likely to have reduced intelligence and behavioral problems. Lead was used in house paints until 1977 and nearly 65% of children in Buffalo have lead toxicity.¹⁴ Asbestos exposure is one of the most dangerous concerns, as exposure to asbestos dust may cause life threatening cancers and lung disease later in life. These benefits of safe and non toxic housing are hard to put a price on.

II. 456 Massachusetts Avenue: The Affordable Green Rehabilitation in Practice

PUSH purchased the building at 456 Massachusetts Avenue at city action in October 2005 for approximately \$7,000. The four-unit building was built in 1904 and includes a store front. At the time of purchase, the house had been abandoned for three years and was full of garbage, including old tires. Over 12 months beginning in March 2006, PUSH worked together with partners including the Urban Community Corporation, The Mayor's Summer Youth Program, Youth Build, Buffalo State College Design Department, and the Plumbers Union to successfully transform the once abandoned building.

¹⁴ Neighborhood Legal Services, Inc. *Lead and Your Home*. 1991.

As stated above, rehabilitating an existing house is far greener than building a new structure because it preserves existing materials and Greenfield sites while also minimizing the potential environmental impacts that result from transporting, manufacturing and using new materials. Rehabilitation is also attractive because it requires less money and can be completed more quickly. However, rehabilitating also limits the green building options available to any given project.

In PUSH's case, the project is further limited by budget and time constraints. PUSH's greatest challenge in building green is that many of these methods have a higher cost up front even though they lead to less expensive operating costs. This presents a lesser challenge for a for-profit or luxury apartment building because investments can be recouped by charging higher rent once the units are completed. However, PUSH's goal is to create housing that is both affordable and green on a tight budget. Even within these narrow parameters, PUSH was able to use a variety of factors to create a green, safe and affordable housing co-operative.

PUSH was fortunate in that the house had a relatively new roof and a decent electrical system, both of which would have necessitated a high cost and a great deal of labor to improve. PUSH was also able to put more of the money in its budget towards green materials by using community labor resources to its advantage. Much of the labor done on the house was accomplished by young people as a part of summer programs, apprentice programs, and volunteerism. The local Plumbers Union donated a great deal of time to help with the house and work with the youths involved in rehabbing the house. By using these community resources PUSH was able to accomplish much more for a

much lower cost and was also able to facilitate training and mentoring for young people in the community they serve.

The most important and effective energy efficiency measure taken by PUSH was to install high R-value insulation in the house, especially in the roof and in the basement, but also in the walls of the units. R-value is the standard measure of heat retention, based on the material, thickness, and density of insulation. A higher R-value indicates a greater ability to insulate. Adding insulation is one of the most cost effective ways to increase a building's efficiency. The PUSH house had little to no insulation in it at the time of purchase, which is typical of the older housing stock in Buffalo. Green builders recommend a range of R-22 through R-30 for wall insulation.¹⁵ Following the renovation, the building is now filled with R-30 insulation, which will prevent heat from escaping in the winter, keep the inside cool in the summer, and make the house quieter, which in turn will reduce energy usage and cost for the house as a whole.

A measure also associated with the insulation of the house was the installation of double-pane argon Energy Star windows throughout the house. When PUSH bought the house, it still had its original windows. The new windows are constituted of two panes of glass with a very small air space between them. This space is filled with argon gas, which acts as an insulator. Energy Star products meet energy efficiency guidelines established by the US Environmental Protection Agency and the US Department of Energy. The Energy Star program estimates that Americans saved a combined total of 14 billion dollars on utility bills by using Energy Star products in 2006, conserving the annual

¹⁵ Chiras, Daniel. *The Natural House: A Complete Guide to Healthy, Energy-Efficient, Environmental Homes*. Chelsea Green Publishing Company, 2000.

emissions equivalent of 25 million vehicles.¹⁶ Doors were also replaced as needed, which also decreased the amount of leaking air throughout the house.

Another cost effective measure that increased the energy efficiency of the units is the use of compact fluorescent light bulbs (CFLs) instead of traditional incandescent light bulbs. CFLs use only a quarter of the energy of an incandescent bulb but provide the same amount of light.¹⁷ Incandescent bulbs also cast off extra heat as a bi-product. The US Green Building Council recommends changing out five frequently used incandescent light bulbs for CFLs to reduce an electric bill by 100 dollars over the course of a year.¹⁸ The PUSH house currently uses approximately 75% CFLs to 25% incandescent bulbs.

PUSH recycled used appliances for use in the units, because the higher cost of new, energy efficient appliances was prohibitive. Though the appliances may be less efficient, re-using existing materials is an important aspect of green design.

The PUSH House also uses on-demand water heaters in each of the units. These heaters are also known as “demand,” “tankless,” or “instantaneous” water heaters. A conventional water heater constantly heats a specific amount of water to a certain temperature. An on-demand water heater heats water only when it is needed. The water is heated as it passes by a heating element as it is piped to the user. On demand water heaters are between 24 to 34 percent more energy efficient than storage tank water heaters.¹⁹

The house was also outfitted with new Energy Star rated furnaces. The US Department of Energy estimates that more than half of most homes energy costs are the

¹⁶ Energy Star Overview of 2006 Achievements, EPA

¹⁷ Chiras, Daniel. *The Natural House: A Complete Guide to Healthy, Energy-Efficient, Environmental Homes*. Chelsea Green Publishing Company, 2000.

¹⁸ US Green Building Council, *16 Ways to Green Your Home*.

¹⁹ USDOE

result of heating and cooling expenses. Heating homes in Buffalo presents a much larger expense than cooling homes. As previously mentioned, good insulation and an energy efficient heating system are vital to increasing the affordability of housing for low income residents. Energy Star rated furnaces have an Annual Fuel Utilization Efficiency or AFUE of 90 percent or greater. An AFUE of 90 percent would mean that 10 percent of the fuel used is wasted, but 90 percent is transferred into heat. Depending on the AFUE of an existing furnace, almost half of every 100 dollars spent on heating costs could be saved by upgrading to an Energy Star furnace.²⁰

An energy efficient form of cooling is also provided through two Energy Star ceiling fans installed in the house. Ceiling fans are far more energy efficient than air conditioning systems or units. These fans will also aid in ventilation and air circulation in addition to helping to cool the house in the summer months.

PUSH also used some passive design strategies when renovating the house. Passive heating and cooling, or passive design, is the practice of designing a building so that it remains a comfortable temperature with minimal mechanical heating or cooling. Passive design methods use natural light and windows to supply or avoid heat, light, and ventilation. For example, common passive design technique situates a building so that it makes the most of southern facing exposures to sunlight. Depending on the climate where the house is built, windows can be placed to maximize heat from sunlight during winter months. Shades and overhangs can be used to control the degree of heat and light that enters the house when it is warm. Minimizing east and west facing windows also helps to keep a house cool during the summertime. Building interiors must be open enough so that

²⁰ US DOE at http://www.eere.energy.gov/consumer/your_home/space_heating_cooling/index.cfm/mytopic=12530

air can circulate. It is difficult to completely use this type of design strategy when rehabilitating an existing building. However, a renovator such as PUSH can make the most of existing windows and exposures in order to maximize natural sources of heat and light.

In fact, passive heating and cooling were used in the PUSH house renovation. Before renovation began, PUSH consulted an architect to find out whether any changes should be made to the interior of the house. The interior of the downstairs apartment was opened up by removing a wall. This change provides for more natural light and better ventilation throughout the unit. The insulation provided throughout the house is also an important component of passive design, because it allows the house to retain a warmer or cooler temperature.

The indoor air quality and general environment of the house has also been improved as a result of the rehabilitation. In addition to now being clean and free of debris, the house is now a much healthier home for residents to live in. Prior to the renovation, water damage in the basement and on the first floor led to an infestation of mold and mildew.

When renovating the apartment, PUSH removed the mold and replaced the materials that had been infested. At the time of purchase the house was also contaminated with lead paint, especially on and around the old windows. Lead paint remediation was performed as a part of the renovation.

PUSH used non- toxic paint throughout the house. This paint is free of Volatile Organic Compounds (VOCs), which contain chemicals that cause negative health effects including headaches, nausea, kidney damage, liver damage, allergies, and irritation of the

eyes, nose and throat.²¹ VOCs are found in paints, cleaning supplies, and building materials. As a result, indoor levels of VOCs are much higher than levels found in the outdoors. By using a non toxic indoor paint, PUSH increased the indoor air quality of the building and made it a healthier place to live.

As a result of the rehabilitation the house also has new wood flooring, which lasts longer and requires less maintenance than carpeting. Carpeting may also contain VOCs and can retain allergens such as dander and dust mites.

Many green design and building options were considered during the project and ultimately weren't pursued because of cost. These considered options include solar powered sump pumps and other larger alternative energy generators for the house such as solar or wind power. PUSH also considered using energy efficient appliances and renewable building materials. These include bamboo wood flooring and cabinets and linoleum flooring. These building materials are considered environmentally sustainable products because they are made from raw materials that quickly renew themselves, or quickly grow back.

PUSH successfully created a sustainable and affordable housing cooperative. In the end, the total cost for the rehabilitation was approximately \$115,000. This breaks down into \$28,750 per unit, a figure that is low compared to similar projects. In Washington DC, a non profit called the National Housing Trust worked with a private developer to rehabilitate a large apartment complex (84 apartments) named Galen Terrace for affordable housing. Though the scope of the Galen Terrace project was much larger than that of the PUSH house, the National Housing Trust estimates that the rehabilitation spent \$60,000 per unit. The Galen Terrace project included some reflective

²¹ US EPA at <http://www.epa.gov/iaq/voc.html>.

roofing material and efficient refrigerators and did not include on-demand water heaters; however, many of the other green aspects of the two projects are the same.

Over the course of the PUSH renovation, each unit of the building was completely rehabilitated. The store front will serve as a community area for the residents to use as they choose. Overall, the house is now cleaner, brighter, healthier, more efficient and more sustainable than it was even before it became abandoned. However, every house can always be more efficient. With a larger budget, there are a number of ways that PUSH can produce affordable housing that is even more environmentally sustainable.

III: Future Rehabilitations

As PUSH continues to rehabilitate housing on the West Side of Buffalo, each house will have different needs and will present new challenges. Building on the experience and knowledge gained during the rehabilitation of the first house, PUSH now has a positive and proven track record. PUSH can use a number of green design strategies in order to make the houses they work on even more efficient for a very low cost.

When consulting with architects before beginning the renovation of the next house, PUSH should consider using the siding and windows of the existing structure to maximize the potential for passive heating and cooling. Daylighting, a technique which adds windows to buildings in order to maximize natural light, could also be used when considering how to redesign an existing building.

Another planning stage activity that could maximize a project's efficiency would be to have an energy audit or "blower door test" performed on the structure prior to beginning designs for renovations. This type of test will indicate where the house is least efficient and which areas may need the most attention. These tests typically cost between

\$50 and \$150. PUSH may be able to work with the local organizations that administer state and federal weatherization programs to have a test done for less.

PUSH should continue to utilize all of the energy efficient features they installed at their first house. An additional low cost measure that increases efficiency is the use of programmable thermostats in units. These thermostats are relatively inexpensive, and can be set by the residents to automatically turn down the heat during the night or while the resident is out of the house. Ten percent of a user's heating costs can be reduced by turning the thermostat down between 10-15 percent for eight hours a day.²²

Water conservation is another area where residents would be able to save money and conserve resources. By putting aerators in faucets and low flow showerheads, residents can conserve water and costs. These measures are also inexpensive to purchase and install.

A great deal of energy can be conserved through the use of energy efficient appliances. Though new energy- efficient appliances are more expensive than less efficient, used appliances, they are a good investment because refrigerators and freezers can account for up to a quarter of household energy use.²³ Energy Star rated appliances use between ten and fifteen percent less energy and water when compared to non-efficient models. On average, refrigerators, televisions, and stand alone freezers are the largest electricity consuming appliances, followed by electric dryers and ovens.²⁴ The US

²² American Gas Association Fact Sheet, "Energy Efficient Tips to Make Your Home (and Your Wallet) More Comfortable. Winter 2005-2006.

²³ Global Green USA, Global Green 101 "Top 20 No- or Low Cost Green Building Strategies"

²⁴ Consumer's Guide to Effective Environmental Choices, p68

Green Building Council estimates that each Energy Star appliance saves the buyer \$50 in energy costs over the course of a year.²⁵

When deciding how to most effectively rehabilitate a house and create an energy efficient one, buying energy efficient appliances may provide more efficiency to a home than new windows will, depending on the quality of the existing windows. If the existing windows are usable, instead of replacing windows it may be just as effective (and much more cost effective) to seal leaks through weatherization practices such as caulking.

Another important green building practice uses the land surrounding a building to increase the efficiency of the building. Landscaping in the form of natural landscaping and Xeriscape practices can make a house more efficient in addition to being visually appealing. Proper landscaping can prevent water runoff, act as a carbon sink, work to prevent urban heat island effect, and reduce energy consumption (and therefore costs) by providing shade for the house and by blocking wind. The U.S. Department of Energy states that “well designed landscaping also can help reduce heating energy consumption by 30 percent, air-conditioning energy consumption by 75 percent, and water consumption by 80 percent.”²⁶

PUSH should work with existing organizations on the West Side to devise a landscaping plan, where possible. Low maintenance native planting will provide several benefits to the house, only one of which is increased energy efficiency.

Another, more costly method of using the outside of a building to decrease the energy costs and environmental impact of the building as a whole would be to create a green roof. “Green roofs” are generally roofs covered in plants, which help to keep

²⁵ US Green Building Council, *16 Ways to Green Your Home*.

²⁶ Global Green USA, Global Green 101 “Top 20 No- or Low Cost Green Building Strategies”

buildings cooler, combat urban heat island effect, and prevent storm water runoff. This type of green roof is not always feasible when rehabilitating an existing home. However, if a future PUSH project is in need of a better roof, PUSH could also consider “cool roofs.” Cool roofs are made with light colored materials that deflect heat and keep houses cooler. The cooler temperature also helps this type of roofing live longer.

With a large investment, PUSH could pursue using on site alternative energy generators such as solar power or wind power. Photo-voltaic panels can be placed on roofs or on other parts of a house to capture solar power. Miniature wind turbines are also marketed for homes. Houses and buildings that generate their own power sometimes create so much that they are able to sell the excess to the grid, or the power companies. Another alternative heating option is the use of geothermal heating, in which a deep well is used to access the constant temperature found deep underground. The warmer (or cooler in summer) air is then circulated throughout the building. This type of energy generation would be a terrific benefit to low income residents in that it would eliminate many utility costs, but these measures are also the most expensive to accomplish.

PUSH could also invest in using more renewable building materials. This would be a good investment for the environment as a whole, but would confer less direct economic benefit to the residents living in the units. Many renewable materials are durable and have long life cycles, which means that they wouldn’t need to be replaced as quickly, which would recoup some of the cost of the investment for PUSH. PUSH could then pass its savings on to its tenants in the form of lower rents.

Where possible, it is practical and less expensive for PUSH to continue to reuse materials and to shop locally where possible. If groups like Buffalo ReUse can

successfully deconstruct homes in Buffalo as an alternative to demolition, any materials that PUSH would be able to reuse and buy locally would be environmentally sustainable and also help to keep project costs down, which would allow for more of a project's budget to be put towards green design.

Ultimately, the greatest obstacle to PUSH being able to do more green building is the high up front cost associated with many of these methods. Though costs are recouped through lower operating costs, it is difficult for any not for profit organization to finance a project like the PUSH house. The National Housing Trust, the non profit involved in rehabilitating the units at Galen Terrace, employs 6 underwriters to maintain its funding. If governmental agencies and funding entities did more to support the work of PUSH and groups like it, the end result would be more sustainable and more affordable housing.

One way that PUSH may be able to increase funding support would be through increased partnership with agencies and with the City of Buffalo government itself. PUSH already has a long list of partners (including the City of Buffalo Mayor's Youth program) and funders who helped to build the PUSH house. By expanding this list, PUSH can continue to rehabilitate houses and improve the West Side community.

One way to increase funding would be through City cooperation. The City currently has an "urban homesteading" program in which the City Planner is able to sell vacant and abandoned properties for 1 dollar. This is a good deal for the city, because the property is returned to the City's tax base instead of languishing. One of the problems with the urban homesteading program is that many times the people who buy a property are unable to acquire the financing necessary to rehabilitate the home, because the cost of renovation is higher than the value of the house.

PUSH is an excellent candidate for the urban homesteading program, because they have the community resources and the ability to acquire the funding necessary to fill the gap between a building's value and rehabilitation costs. Further, PUSH now has the experience and the track record to show that they are committed to completing these projects. Had the City sold PUSH the house on Massachusetts Avenue in such a deal, PUSH would have had \$6,999 more to devote to rehabilitation. PUSH's not for profit status may interfere with the City being able to gain substantial tax benefits. However, it is still in the City's financial interest to support PUSH's efforts because as houses are fixed up, the property values throughout the neighborhood will increase, which will also lead to increased tax revenue for the City. Buffalo currently uses a similar program to sell lots to Habitat for Humanity.

PUSH should also seek partnerships with groups like Habitat for Humanity and agencies like HUD. These groups are not only also involved in providing affordable housing opportunities in Buffalo, but they are also interested in using green design principles, which PUSH has already accomplished. PUSH may be able to work with these groups to facilitate projects, increase funding opportunities, and increase exposure. For example, Habitat for Humanities has a deal with Whirlpool in which that company donates Energy Star appliances to Habitat houses. Donated efficient appliances would decrease rehabilitation costs while increasing the efficiency of the project.

Increasing funding sources on a state, local, and national level is a full time job requiring immense time and dedication. However, increased funding and support will allow PUSH Buffalo and other groups to finance housing that is affordable and efficient.

IV: Conclusion

Governments, agencies, foundations, and not for profit organizations can all learn from PUSH's experience and accomplishment. An increase in the amount of affordable, green housing in Buffalo will benefit residents, neighborhoods and the City of Buffalo as a whole. Residents gain housing that is more affordable and healthier to live in. Neighbors will welcome the reversal of blight and the rehabilitation of their neighborhood. The City will experience neighborhood redevelopment, increased homeownership, decreased carbon emissions, and raised property values.

Agencies and not for profit organizations involved in the construction and development of affordable housing should replicate PUSH's model to create affordable green housing. Governments and foundations should increase funding and otherwise offer greater support for affordable green housing projects, particularly those that rehabilitate existing abandoned housing, in order to increase the amount and availability of affordable, safe, and sustainable housing.