PROJECT ACT LOCALLY:
ALBEMARLE HOUSING IMPROVEMENT PROJECT

LEED as a Potential Sustainable Construction Option

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Prof. Phoebe Crisman
Workshop Leader: Nick Wickersham
Team members: Sarah Buchholz, Jessica Welch, and Catherine Martin

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ABSTRACT

The goal of our project was to come up with a successful green construction method for the Albermarle Housing Improvement Project to use in their local housing renovations. We specifically focused on LEED and its viability in relation to the type of work AHIP does. In order to do this, we researched LEED in depth, as well as other sustainable design methods such as ReGreen. We looked at various case studies around Charlottesville and compared them to what AHIP does, in terms of cost, size, and scope of work. We found that LEED is not the most appropriate option for AHIP to use as it focuses primarily on new construction and gut renovations, whereas AHIP generally just does smaller scale work. ReGreen is a lot more relevant to AHIP as it is flexible and can be applied to any size project on any part of a house. Although LEED can still be an option for larger new construction projects, the method that AHIP uses is very site and project specific. Our research and findings are given below, along with our final conclusion.

INTRODUCTION

Our larger workshop project has addressed the issue of green building in residential housing for Charlottesville, Albemarle, and the surrounding areas through an organization called Albemarle Housing Improvement Program (AHIP). Our small group specifically researched LEED (Leadership in Energy and Environmental Design) and how it can be applied to the rehabilitation of existing housing and the building of new housing.

Our community partner was The Albemarle Housing Improvement Program, or AHIP. AHIP is a non-profit organization that works in the city of Charlottesville and the counties of Albemarle, Nelson, Louisa, and Greene in central Virginia. Utilizing a large number of volunteers and local artisans, AHIP focuses on housing rehabilitation, emergency house repairs, and a number of supportive services in low-income areas. AHIP began 35 years ago and has served thousands of people in the local community. Recently, AHIP has partnered with Habitat for Humanity in an effort to do more with the limited funding available due to the economy.

AHIP has used green building methods in past projects, and they would like to look into the pros and cons of expanding their green building initiatives. These pros and cons include the cost/benefit of being green building certified. AHIP needed information regarding what is required for LEED certification. They also requested information on similar projects that have been implemented in the past, how their new projects might be funded, and how to productively engage with the communities they are working in.

The stakeholders in our project include the management team of AHIP, the community residents that AHIP works with, those providing AHIP with grants, AHIP's community partners, like Habitat for Humanity, and AHIP's volunteers and artisans. AHIP and its partners (volunteers, artisans, financial partners, etc) may be affected in how they go about rehabilitating/building. This could also involve different levels of retraining. The residents that AHIP works with will hopefully experience more efficient homes that will translate into lower utility bills and reduced need for maintenance due to a long-term solution to their needs. All stakeholders will also have an increased awareness about sustainable housing and practices.

We focused on LEED's REGREEN renovation program as well as a specific aspect of LEED called LEED for Homes. LEED for Homes applies the LEED rating system, normally used in the new construction of large office buildings, to residential housing. We researched what is involved in becoming LEED certified and collaborated with another small group to find out if LEED or REGREEN are the best ways for AHIP to approach green building—this involved looking into whether or not the LEED system is an appropriate measure for AHIP to implement in its work on new and existing houses.

BODY

Approach

Project Mentors: Ravi Respeto, AHIP Development Director
Joyce Dudek, Associate Director of Property Development

Primary Resources: U.S. Green Building Council LEED Website and Resources
LEED for Home Case Studies
Harvard GSD Research Project

Our approach to this project was to research the LEED certification process and evaluate if it is the best green building program to follow in comparison to other programs when applied to AHIP's work. After some preliminary research, we found that the LEED system for residential buildings is only applicable to new buildings, and consequently may not be the best option for AHIP to use, considering that their work is primarily renovations and improvements (there is a LEED certification for renovated buildings but this applies more to commercial buildings). However, LEED does have REGREEN Residential Remodeling Guidelines that provide a set of green standards to follow for small scale residential projects and suggests green measures that can be implemented into the specific project. Unfortunately, this program provides suggestions but does not allow for certification or recognition of green standards. As a result, our project involved researching LEED and the REGREEN process and then converging with another group that researched other green construction methods in order to create a table and checklist showing all green construction options as well as what we believe to be the best choice for AHIP.

Our research consisted of three parts:

1. Researching the LEED system and the different types of certification they offer, as well as the components necessary for certification. Considering REGREEN as a viable option for AHIP.
2. Looking at local and regional case studies including the ecoREMOD homes, REGREEN Housing, Habitat for Humanity projects, and other case studies. We will looked at the Harvard GSD study and the examples they analyze.
3. Assessing our findings and determining a realistic set of criteria that AHIP can follow to make their buildings as green and sustainable as possible. We compared our research with another group researching green building methods and determine what the best solution is for AHIP.

Budget and Funding

AHIP relies on funding from government and private grants as well as private donor contributions. The advantage of LEED is that it is a donor incentive to give more money as it is an attractive asset for Housing projects.

However, there are also costs associated with becoming LEED certified.
Costs associated with LEED registration and Certification:

LEED for Homes Pricing - Single Family Projects

	SINGLE FAMILY HOUSING (COST PER UNIT)		SINGLE FAMILY VOLUME
	REGISTRATION	CERTIFICATION	(10 OR MORE SINGLE FAMILY UNITS)
USGBC MEMBER	$150	$225	CONTACT YOUR LEED FOR HOMES GREEN RATER FOR DISCOUNT PRICING INFORMATION
NON-MEMBER	$225	$300	

LEED for Homes Pricing - Multifamily Projects

	LOW-RISE MULTI-FAMILY HOUSING (COST PER BUILDING)		MID-RISE MULTI-FAMILY HOUSING (COST PER BUILDING)	
	REGISTRATION	CERTIFICATION*	REGISTRATION	CERTIFICATION*
USGBC MEMBER	$750	$0.035 PER SQ FT	$900	$0.035 PER SQ FT
NON-MEMBER	$900	$0.045 PER SQ FT	$1,050	$0.045 PER SQ FT

** For multifamily projects with 50 or more units, please contact your Green Rater for certification pricing.*

http://www.usgbc.org/DisplayPage.aspx?CMSPageID=147#registration

Rehab costs are dependent upon individual home projects. For smaller scale projects the USGBC ReGreen checklist is a useful resource.

The state of Virginia also provides various incentives for different green building methods and appliances. Depending on the exact renovations used in the AHIP project some of the incentives below could apply as far as funding is concerned. They can be found at this website: http://www.dsireusa.org/incentives/index.cfm?getRE=1?re=undefined&ee=1&spv=0&st=0&srp=1&state=VA and are summarized below.

Financial Incentives
Green Building Incentive

- Clean Energy Manufacturing Incentive Grant Progam
- Green Jobs Tax Credit
- Solar Manufacturing Incentive Grant (SMIG) Program

Leasing Program

- Commonwealth's Energy Leasing Program
- Commonwealth's Master Equipment Leasing Program

Local Rebate Program

- Local Option - Clean Energy Financing

Performance-Based Incentive

- TVA - Generation Partners Program
- TVA - Mid-Sized Renewable Standard Offer Program

Personal Deduction

- Income Tax Deduction for Energy-Efficient Products

Property Tax Incentive

- Local Option - Property Tax Assessment for Energy Efficient Buildings
- Local Option - Property Tax Exemption for Solar

Sales Tax Incentive

- Sales Tax Exemption for Energy-Efficient Products (Sales Tax Holiday)

State Loan Program

- Virginia Resources Authority - Project and Equipment Financing

State Rebate Program

- Virginia - Geothermal Heat Pump Rebate Program
- Virginia - Home Efficiency Rebate Program
- Virginia - Residential Energy-Efficient Appliance Rebates

Utility Loan Program

- TVA Partner Utilities - *energy right* Heat Pump Program

Utility Rebate Program

- Charlottesville Gas - Residential Energy Efficiency Rebate Program
- Columbia Gas of Virginia - Business Efficiency Rebate Program
- Columbia Gas of Virginia - Home Savings Rebate Program

- Dominion Virginia Power - Commercial Energy Efficiency Programs
- TVA - Energy Right Solutions for Business
- TVA Partner Utilities - *energy right* New Homes Program
- TVA Partner Utilities - *energy right* Water Heater Program
- TVA Partner Utilities - In-Home Energy Evaluation Program
- Virginia Natural Gas - Residential Energy Efficiency Rebate Program

Documentation and Assessment

LEED for Homes Rating System Checklist Measures:

http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1989

For smaller scale projects a viable alternative to LEED is the USGBC ReGreen program. ReGreen and LEED are both green guidelines presented by the USGBC. The ReGreen program offers room-by-room guidelines for smaller projects. The ReGreen Program has been adapted from the Passive House Program. There are a number of resources on their website (regreenprogram.org) Including:

- A Home and Interiors Assessment http://www.regreenprogram.org/docs/regreen_home_assessment_form.pdf
- Residential Remodelling Guidelines http://www.regreenprogram.org/docs/regreen_guidelines.pdf

By fulfilling parts of the LEED and Regreen checklists and guidelines, one can easily assess how green the specific project is and what it is achieving, even if it does not necessarily become certified. Unfortunately, there are ways to receive LEED points without actually making a sustainable difference. A recent study done by the Harvard Graduate School of Design assessed the reliability and effectiveness of LEED and how successful it truly is. The study, although not entirely relevant to this project, as it dealt with LEED's effects on transportation and harmful gas emissions from cars, proved that even if a project becomes LEED certified, it can still do so without actually influencing the amount of gas emissions. This study looked at the ways in which people get to work and travel around town, and what each part of the LEED process has an effect on. The study showed that projects can easily avoid certain LEED points in areas that are truly effective, but still receive points in other areas that are less relevant to being sustainable. No study has been done on the immediate effectiveness of LEED in terms of housing and remodeling, however, the Harvard Study does present flaws in the program.

Metrics for Measuring Success:

There are various online resources provided for measuring the efficiency of energy and water use in buildings. Unfortunately, the most informative and specific of these tools, such as the Portfolio Manager provided by Energy Star (http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager) are only applicable for large and commercial buildings. The best tool for a small scale renovation would be that recommended by the U.S. Department of Energy, the Energy Star Home Energy Yardstick (https://www.energystar.gov/index.cfm?fuseaction=HOME_ENERGY_YARDSTICK.showGetStarted) which could provide a very basic energy rating for comparison before and after the renovation. A comparison of this rating for before and after the renovation could give AHIP concrete statistics of how much their renovations have improved energy efficiency in the home.

Rehab versus New Construction Projects

Through our research we have come up with two potential paths for AHIP depending on the type of project. The first path involves rehab projects, the second path involves major gut or new construction projects. In researching LEED we have come across LEED for Homes and the ReGreen program which are compared in the graph below .

The merits of different systems in regards to rehab or new construction are examined below:

Rehab Projects: As LEED certification is not a viable option when looking at rehab projects, it would be better for AHIP to utilize ReGreen to still be sustainable. Although this program does not offer certification, it is the best option for rehab work. It is recommended that AHIP uses Energy Star certified products in addition, to maximize sustainability.

Major Gut/New Construction: If AHIP ever takes on a major gut or new construction project, LEED would certainly be a viable option. LEED has a comprehensive set of guidelines and is an internationally recognized standard. There are also many resources for those seeking LEED certification.

Case Studies:

EcoMOD

EcoMOD is an organization that creates highly efficient and environmentally responsive housing projects that are affordable and appropriate for lower income housing organizations. EcoMOD is targeted at families who could benefit from the lower energy, water, and maintenance costs. These modular housing units have been created for organizations including Habitat for Humanity and Piedmont Housing Alliance, as well as prototype designs for other non-profits. They utilize sustainable design, affordable housing, and prefabricated construction.
So far, six units have been built and their sizes range from 384 square feet to 1,464 square feet. These units include four EcoMOD projects and two EcoREMOD projects. EcoREMOD projects are renovations of already existing housing units.

One example below presents how EcoMOD has used LEED successfully in a new construction project, and the other shows how EcoREMOD uses sustainable design for smaller renovations.

EcoMOD4 Thru House: The Thru house was built for Habitat for Humanity of Greater Charlottesville and is the closest ecoMOD house to netzero energy usage. The design includes a super insulated building envelope along with an optimized wood frame, a stormwater management system, and pervious concrete paving. It also encompasses geothermal heating and cooling with a photovoltaic solar array, as a result of funding from Dominion Virginia Power and other companies. Thru House is registered with LEED for homes and has received one of the highest certifications for LEED.

EcoREMOD1 ENERGY: This first ecoREMOD project is located in Charlottesville and achieves sustainable renovation through affordable strategies. It is a demonstration of the uses of energy, water, and material efficiency for the rest of the community. Like the Thru House, this project aims to achieve LEED Gold Level certification upon completion in 2011.

REGREEN

The ReGREEN program focuses on measures that can be implemented to improve already existing construction. It can include anything from painting a room to remodeling an entire home. Unlike new construction, remodeling must take into account existing conditions. Therefore, it includes the tricky task of systems integration of the existing with the new. Due to the site-specific quality of the work, green remodeling is managed by the REGREEN program with a best-practice guide rather than a rating program. The program is also very specific in design and construction that is site specific and emphasizes the systems quality to residential remodeling. REGREEN guidelines are meant to be used in conjunction with other resources and they are meant to provide guidelines on a variety of projects and thus do not give exact guidance on specific projects. REGREEN guidelines are not a rating system, although they are based on LEED and thus cover as many areas as possible including energy ratings, water efficiency criteria, materials selection and indoor air quality.

Case Study 2: Jefferson County, Missouri

Location: Jefferson City, MO
Bedrooms: 3
Bathrooms: 1.5
Living Space: 1600 sqf

Cost (USD/sq. ft.):
$55/sqf

Site goals to create a more sustainable home:
-keep the same footprint but provide more living space by building more stories
-tighten building envelope
-manage moisture and create more living space by building downwards into the ground
-create better indoor air quality
-improve the site

Improvements to make the home more energy efficient:

- Foundation: insulated and air-sealed with R-8 Icynene
- Above-grade walls: R-19 "flash and fill" (2x4 inset walls sprayed with 2 in. of foam and filled with cellulose)
- Roof: R-40 cathedralized and sprayed with Icynene
- Windows: Quaker AdvantEdge (U-factor=0.30; SHGC=0.29; VT=0.50)

Case Study 3: Habitat for Humanity of Kent County in Grand Rapids, Michigan took on the challenge of making all of their new projects LEED certified. The USGBC has a case study on their website from one of these projects. This case study is relevant to AHIP as it looks at a low-income housing project and connects LEED to it. This case study goes to show that LEED really is a viable option for organizations like AHIP.

Here are some of the numbers presented by this case study:

- The Kent County Habitat for Humanity has built 54 homes that are LEED certified and have "32% improved energy efficiency."
- This specific home was LEED Silver Certified and attained 59 out of a possible 130 points

The breakdown of points for each LEED criteria is as follows:

LEED® Facts
320 Dickinson
Grand Rapids, Michigan

LEED for Homes
Certification awarded November 12, 2008

Silver	**59***
Sustainable Sites	8/21
Water Efficiency	4/15
Energy & Atmosphere	19/38
Materials & Resources	6/14
Indoor Environmental Quality	7/20
Locations & Linkages	10/10
Awareness & Education	1/3
Innovation & Design	4/9

*Out of a possible 130 points.

http://www.usgbc.org/ShowFile.aspx?DocumentID=7873

Dissemination

The Community Outreach groups in our section have presented a plan for educating communities about the benefits of green, energy-efficient homes in order to create awareness, and hopefully, a desire for energy efficient upgrades on their homes. Our research will

be a resource for the Community Outreach groups about green standards. This education program will provide publicity for AHIP's push towards green renovations.
If AHIP begins to use green standards it will encourage other non-profit and for-profit organizations to do the same. AHIP will also set a precedent for similar organizations throughout the state and country regarding renovations in low-income housing areas.

CONCLUSION

While LEED offers a viable certification option for AHIP and their partnership with Habitat for Humanity for new housing or a major gut renovation, we recommend that AHIP implement the REGREEN renovation guidelines offered by the U.S. Green Building Council in their future renovations. REGREEN offers a comprehensive, project specific, and green resource to guide procedures necessary for small-scale projects. These include recommendations regarding energy efficient lighting and appliances, water conservation, and materials to use. We also recommend that all new appliances necessary in renovations be Energy Star certified.

FUTURE WORK

As AHIP moves forward it will be important to collaborate with professionals and consultants who are trained and certified in green building techniques. There are organizations in Charlottesville that specialize in sustainable, efficient housing, like the Local Energy Alliance Program (LEAP) and Think Little, that can be valuable resources to AHIP as they move forward. Also, AHIP will need to keep their stakeholders informed about the new approaches they are implementing.

Donors need to be made aware of new standards that AHIP is adopting, new grants can be identified that sponsor specifically green building endeavors to broaden their funding base, residents that AHIP works with will need to be educated about how to use new energy efficient technology (for example, what kind of lightbulbs to buy that are energy efficient), and volunteers need to be educated in new building processes, as necessary. It will be important for AHIP to involve all of their stakeholders in getting excited about building and renovating "green" in order to move forward in a unified and enthusiastic manner. By doing these things AHIP can also take on the important role of educating the community about the necessity of living in a sustainable, energy efficient manner.

As AHIP adopts new green standards they can also keep track of the benefits to the residents that they work with. Keeping records of energy use before and after renovations, and the cost of each, will be a good way to show a concrete improvement.

LESSONS LEARNED

When we first began researching LEED and green construction methods, we had the mindset that we would easily find one method of sustainable design that AHIP could utilize for all of its projects that would be successful and affordable. However, we ran into numerous barriers while researching LEED. For one, LEED proved to be not as realistic and viable for AHIP as we originally thought, specifically because it mainly deals with large commercial projects. In addition, it was difficult to research other options since, at the moment, LEED is the dominant organization in green construction. As a result, there are very few resources available that discuss other options besides LEED that are in depth enough to really analyze. Since LEED is such a new organization, it is also hard at this point to evaluate its success in various projects, especially long term.

Part of the difficulty in pin pointing one specific option for AHIP to use is that the various options tend to be very project specific. It is hard to determine which option will be successful to AHIP without knowing the specific scope of work and size of project that will be done. Consequently, in terms of our goals from the beginning of the semester, we did not necessarily achieve one distinct option for AHIP that guarantees success. Instead, however, we hope that our research, ideas, and resources will help AHIP to determine the best option for their own specific projects.

If we were to do this project again, I think it would be beneficial for us to research more about AHIP's work specifically, and find solutions for individual projects, instead of just researching green options in general. It would have been useful to use AHIP as a resource more in order to find out exactly what type of work they plan on doing and what they are looking for in terms of budgets, sustainability, and certification.

APPENDICES

Acknowledgements

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