Urban Issues Symposium FL08

The City of University City: Sustainable Housing and Development Proposal

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Team Members/ Authors:
Saint Louis University School of Law:
Kat Kane
Aaron Norris
Kelsey O'Brien
Manasi Venkatesh
Saint Louis University School of Public Policy/ Urban Planning:
Pat Dempsey
Washington University School of Architecture:
Lucy Askew
Laura Anderson
Clayton Holmes
Kirsten Pearson
Christal Wilmoth
Matt MacRaild

Faculty:
Prof. John Ammann – Saint Louis University School of Law
Dr. Mary Domahidy – Saint Louis University Dept. of Public Policy Studies
Prof. Jodi Polzin – Washington University School of Architecture
Prof. Peter Salsich – Saint Louis University School of Law

Introduction

Background

Formally, incorporated in September 1906, and lying on the western boundary of Saint Louis City, University City is one of the largest inner-ring suburbs in Saint Louis County. It is additionally bordered by Pagedale, Wellston, Clayton, Ladue, Olivette, and Overland. With so many different municipalities bordering it, it is no wonder that U. City is a self described "eclectic mix of commercial properties, historical architecture and contemporary construction, cultural and recreational opportunities, and fantastically diverse residents."

This diversity is reflected in the demographics of the city: Caucasians make up forty-nine percent of the population, with African-Americans consisting of forty-five percent. Asians and other nationalities account for the remaining six percent. The largest percentage of the population is between twenty-five and thirty-four years old with a median age of thirty-five. The presence of Fontbonne and Washington University results in a large student population which makes up a majority of the eighteen through thirty-four years of age demographic.

The northeast quadrant, which is predominantly African-American, is among the oldest and poorest neighborhoods in University City and is home to more Health and Safety Code Violations than any other neighborhood in the city. Within the northeast quadrant is the Sutter Heights neighborhood. It is home to many modestly sized shotgun-style homes. Unfortunately, the age of these homes, combined with the lack of financial resources on the part of the residents living in them, have contributed to a noticeable deterioration in the neighborhood and an increasing number of vacant lots. Lack of funding has put University City in a difficult position though, as it tries to make improvements. Additionally, low interest loans and grants are extremely limited, as residents must meet minimum income requirements and have no outstanding debt to the city, making it difficult for them to finance any improvements.

With this in mind, University City has issued a Request for Proposals (RFP), seeking a private, residential developer to build "green", LEED certified homes on five vacant lots on a test block in the Sutter Heights neighborhood. The vacant lots have been purchased and belong to the city. The new homes are intended to be more compatible with the modern public's purchasing preferences in regards to size and energy efficiency. Infill development offers the opportunity to increase property values and accommodate a modern lifestyle. At the same time, the new infill development should be harmonious with the existing neighborhood, as specified on page 31 of The Comprehensive Plan Update of 2005. Additionally, it is the desire of the city that this RFP will produce the beginning of a larger neighborhood revitalization effort which will include commercial corridors along Vernon Ave. and Olive Blvd. The fragmented appearance and lack of identity along Olive Blvd. were listed as weaknesses in a SWOT Analysis as part of The Comprehensive Plan Update of 2005.

Urban Planning Proposal

Test Block

The test block that University City identified for this development is bounded by Kingsland Ave. on the West, 66th St. on the East, Bartmer Ave on the South, and Crest Ave. on the North. This block is located approximately one quarter mile from both the Pagedale and Wellston borders of the city.

There are plenty of nearby amenities for the residents of this block to utilize. The Wellston Metrolink station is an eight minute walk. The local Schnuck's is a ten minute walk from this area, with the Heman Park just to the west of the store. Metcalf Park is only a five minute walk along Kingsland.

The Northeast Neighborhood is an area undergoing improvement and we are targeting two specific areas: a potential mixed use development between Olive Blvd and Vernon Ave, near Kingsland Ave, and the possibility of a Transit Oriented Development (TOD) or Transit Adjacent Development (TAD) near the Wellston Metrolink stop, which is near the University City border. By targeting these specific developments, the idea is that larger neighborhood revitalization would occur as a result. These developments will put an emphasis on more sustainable living, beginning with proximity to the Metrolink and other public transit services.

Mixed Use – Olive & Vernon

This mixed use development between Olive and Vernon would have to be an overlay zone that is passed through the zoning regulations. This wouldn't change the underlying zoning code, however it is important to understand that the overlay is needed. This development won't compete with the existing regional retail that is occurring in "The Loop". However, this development will be used by the local residents of the Northeast Neighborhood, complimenting the retail that currently is on "The Loop". The new mixed use development will also create a new place for residents to live and work. This is a great opportunity for University City to encourage expansion in the small business market. The new offices could be used by local residents, who would like to work and live in the same neighborhood. This could help University City by expanding the tax base in which the city can collect from.

Transit Oriented Development and Transit Adjacent Development

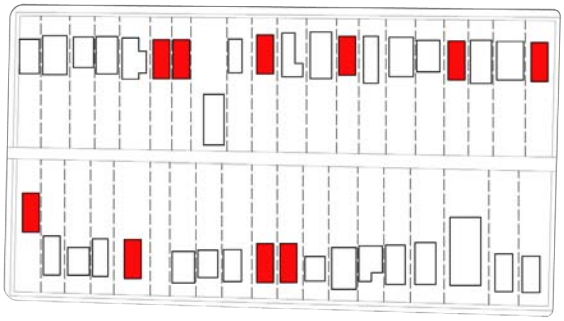
Transit Oriented Development (TOD) is a mixed use development, often commercial but sometimes residential, which is built near a public transit node, such as a Metrolink stop. The intent is to use the public transit stop as the focal point, building outward and upward, so as to encourage the use of and maximize access to public transit. Transit Adjacent Development (TAD), on the other hand, is built near public transit nodes but does not make fully utilize the advantages that the transit stop would offer. Park-n-Ride lots, such as the one next to the Wellston stop, are often symbols of TAD, as they are not using the real estate available according to its highest and best use.

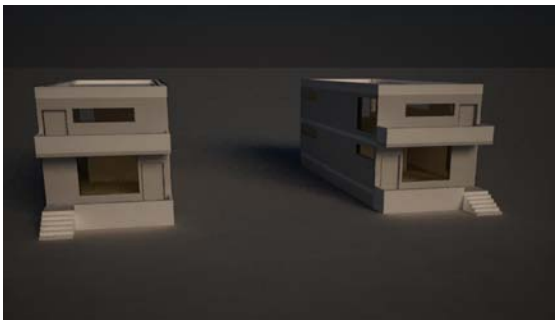
While the Cunningham Industrial Park is currently one hundred percent occupied, the area between it and the Wellston Metrolink stop, along Sutter Ave is rundown and partially vacant, making it a great location for potential development/redevelopment. The proximity of the Metrolink stop offers a prime opportunity for TOD or TAD, which has thus far been ignored.

While a TOD is the more highly regarded of these two types of developments from a planning perspective, the fact of the matter is that the actual Metrolink stop lies in Wellston. Any creation of a TOD would have to be made possible either by the City of Wellston, or in conjunction with the City of Wellston. In this case, a comprehensive and cohesive plan not only for the development, but also as a way to decide the political and tax implications of such a joint city development, would have to be created.

A TAD would be a viable alternative for University City though, in the aforementioned strip along Sutter Ave. between, the Cunningham Industrial Park and the Wellston city limit. The city can develop its own land near the Metrolink, and in doing so could create a buffer between the industrial park and the residential area on the west side of Sutter. This TAD would be advantageous to University City because it would ensure that University City would retain all the taxes, the entire jurisdiction, and all other development choices because all of the land would be developed in University City.

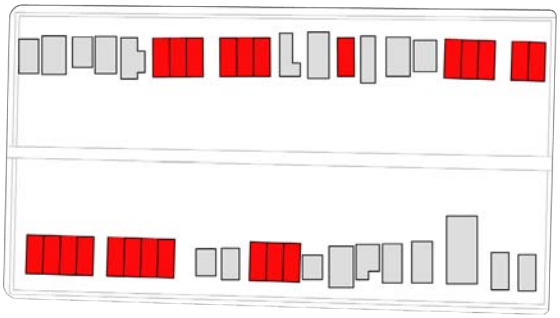
Single Unit Development





The single unit development would create a homogenous infill of the existing test block. The infill would take place and create many individual buildings on the block, creating a slight increase in density over the existing situation. The homeowner would then able to have their own front, side, and back yards, which they would be required to maintain. The individual unit may give the owner a stronger sense of ownership of their land because they have distinctive boundaries that can be seen.

Townhouse Units



A townhouse unit would be a better way to increase the density of the block and the neighborhood. The same architectural plans could be used in the townhouse design as the individual units, the difference being that the units would share interior partition walls. By creating this typology, not only is density created, but the effects turn into scales of economy for the developer, a larger tax base for the city, and a safe environment for the residents. The more units per block would increase the number of people paying property taxes to the city. The more residents that live in the area, increase the sense of community and therefore make it a safer community. Because there are more people in a closer proximity to each other, there is a lower chance of a crime occurring because of the increased chance of a witness.

The developer will see savings based on the savings as a result of the lower construction cost and the economies of scale. Because the builder will be using the same plans, the learning curve of the projects will benefit the developer as they develop more units. The contractors can also space themselves out over more units so that one trade could be installing in a unit while another contractors could be installing their product in another unit. This would make the most efficient use of both time and resources for the developer.

The final advantage to a developer is the ability to not sell all the units at once. If the housing market takes a downturn as the development is completed, the developer has the ability to hold onto some of the units as rental property for a given period of time until the economy becomes better. This allows the developer to also look at allocating a small number of units as affordable income housing which will allow more tax credits and additional federal and state funding. It also could be a way to ensure that the diversity, both socially, but also economic diversity remains in the neighborhood. The units would be indistinguishable from each other, but by having it available for affordable income residents, the developer could gain financial benefits that would lower the construction cost, and therefore lowering the cost of the entire development.

Architectural Proposal

Introduction of LEED Home Design

As requested by the RFP written by the city of University City, the design team went forth and designed a LEED Platinum home for just over $200,000. LEED stands for Leadership in Energy and Environmental Design. It provides a suite of standards for environmentally sustainable construction. The location of the test block provided us many amenity points due to its urban surroundings. Another important strategy we implemented was the use of prefabricated construction. This form of construction is located in a factory where waste is limited and involves building modular components that assemble together to create a whole. Building prefab allotted us many points due to its efficiency in framing and waste factor, in addition to its overall economic feasibility. Benefits of a LEED home include lower energy and water bills, reduced greenhouse gas emissions, and less exposure to mold, mildew and other indoor toxins. The net cost of owning a LEED home is comparable to that of owning a conventional home.

LEED® Facts

Urban Design Symposium:
UCity LEED Homes
City of University City, Missouri

LEED for Homes
Certification Awarded: TBA

Platinum	**88***
Sustainable Sites	20/22
Location & Linkages	8/10
Water Efficiency	10/15
Energy & Atmosphere	16/38
Materials & Resources	13/16
Indoor Environmental Quality	19/21
Innovation & Design	2/11
Awareness & Education	0/3

** Out of a possible 136 points.*

The proposed design was able to achieve 88 LEED points, thereby securing it's position at the Platinum level. Particularly helpful in gaining these points was the compact design of the home (3 Bedrooms in only 1550sf) which allowed for a home-size adjustment in the number of LEED points required. The prime location in University City with many amenities within walking distance was also a key factor in earning points. The following LEED Points Summary will help clarify the means used to satisfy the requirements of gaining LEED status. More detailed information can be found in Appendix B.

LEED Points Summary

Water Efficiency

It was determined, based on budget requirements and feasibility considerations, that some measures of the Water Efficiency Category could easily be incorporated, even at minimal cost, while other measures were outside the scope of this project, from a budget standpoint. While we were able to provide adequate rain catchment downspouts and storage containers for a reasonable cost, the implementation of a greywater system for use in the home was deemed overly costly in this situation. Likewise, while we were able to install high-efficiency plumbing fixtures throughout the home, the specified "very high-efficiency" plumbing fixtures were beyond our means. However, were the budget to increase, even marginally, this type of improvement would be one of the first we would make, as its cost is relatively low when compared to that of a greywater system. Finally, at minimal or no extra cost we provided a highly efficient irrigation system for the site landscaping, which upon successful completion of a third-party inspection would earn the house all points possible in this category of water efficiency. Considering these measures comprehensively, the house would earn 9 out of 15 points in the LEED WE Category.

Materials & Resources

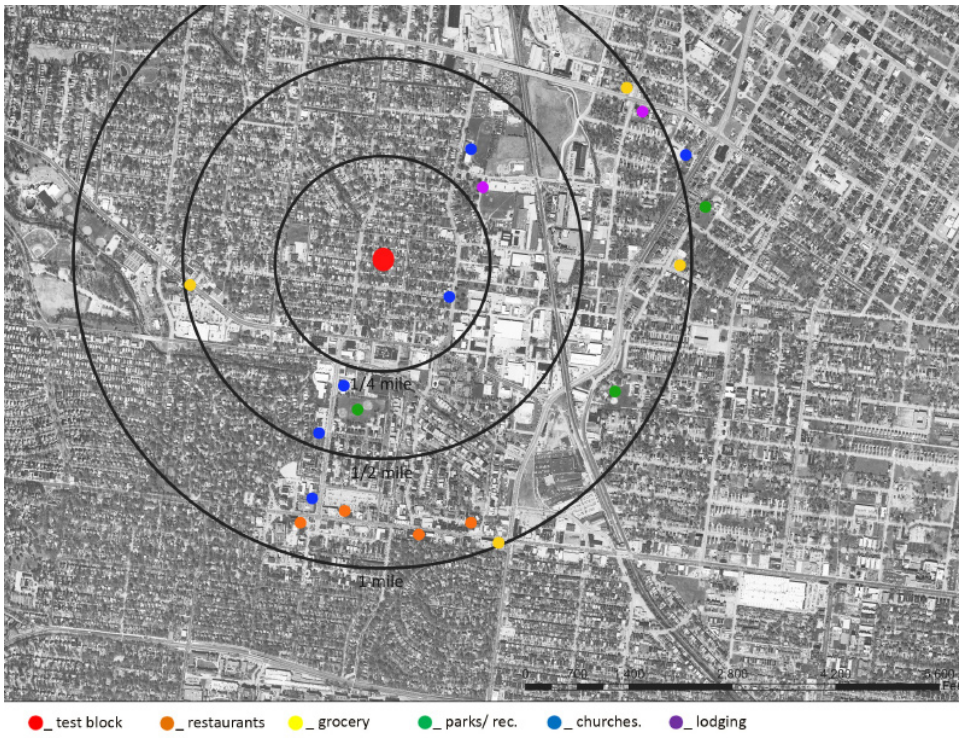
This portion of the LEED For Homes™ rating system asks that the building construction optimizes the use of framing materials, utilize environmentally preferable or regionally produced manufactured products in the home, and also reduce waste generation to a level below the industry norm. In detail, the overall estimated waste factor is less than 10% due to modular, prefabricated construction. This waste factor is defined as "the percentage of framing material ordered in excess of the estimated material needed for construction." Modular, prefabricated construction is being used as an alternative to on-site framing. All principal building sections will be delivered to the job site as prefabricated modules. Modular homes are houses that are divided into multiple modules or sections which are manufactured in a remote facility and then delivered to their intended site of use. These new homes can be constructed in less time than it takes to build a home "on-site". Additionally, the products that are intended to be implemented in the home are either environmentally preferable or locally produced, meaning the products were extracted, processed, and manufactured within 500 miles. Some of these products include: concrete foundation walls with use of 30% fly ash, FSC wood frame walls, bamboo floor, aggregate cement, low voc paint, recycled roofing, etc. See Appendix for specifications of these products. In total, we achieved 13 out of 16 of the total possible points for this section.

Sustainable Sites

The main focus of this section was to take a holistic approach in designing the site, in order to minimize the project's overall environmental impact. The first LEED credits must be earned during the construction phase in order to minimize long-term environmental damage to the lot. Measures such as erosion control and minimized disturbance to the site are achieved through low-waste, low-impact features of Prefab components. The next LEED credits encourage a reduction in invasive landscaping and irrigation water use. By utilizing a local Saint

Louis resource, we where able to incorporate the use of Naturescaping. Naturescaping is defined by the Kemper Center for Home Gardening as, "*a landscaping approach that focuses on working with the natural character of the land, rather than trying to transplant species that are not native or adapated to the natural conditions.*" The proposed landscaping plan would revive the site into a Prairie Garden. Benefits for using naturescaping include reducing the need for fertilizers and pesticides that contain toxic chemicals. Next, since Saint Louis is located in an area with a moderate to heavy termite infestation probability it is necessary to integrate nontoxic pest control measures, such as keeping wood away from the soil by building up a 12 inch above grade foundation wall, as well as insuring that the structure is fully sealed with caulking. Proposed surface water runoff management would be achieved through landscape swells, a greenroof, and pervious pavers. Finally, credits were earned due to the compact nature of the original development, the site is considered high density, meaning that the average housing density is classified as having 10 or more dwelling units per acre of buildable land. All together, we propose that a total of 20 points out of a possible 22 could be earned in this category, with a low initial cost in addition to future low maintenance costs.

Location & Linkages



This portion of the LEED For Homes™ rating system asks that the building avoid development on environmentally sensitive sites, encourage building home near existing communities with intact infrastructure, encourage public transit, and have access to green space, such as parks. In detail, our house design is not being developed on land with elevation below the 100-year floodplain. Nor is it being developed on land that is identified as habitat for any species on federal endangered list. The site does not contain land that is public parkland, nor does it contain any "prime" or "unique" soils identified by the Natural Resources Conservation Service soil surveys. At least 75% of the development site immediately borders previously developed land. The development site is located within ½ mile of 11 basic community resources, such as arts/ entertainment center, bank, community or civic center, library, dry cleaner, restaurant, school, supermarket, place of worship, office building, etc. (see Amenity Map). In total, we achieved 8 out of10 of the total possible points for this section due to its existing location.

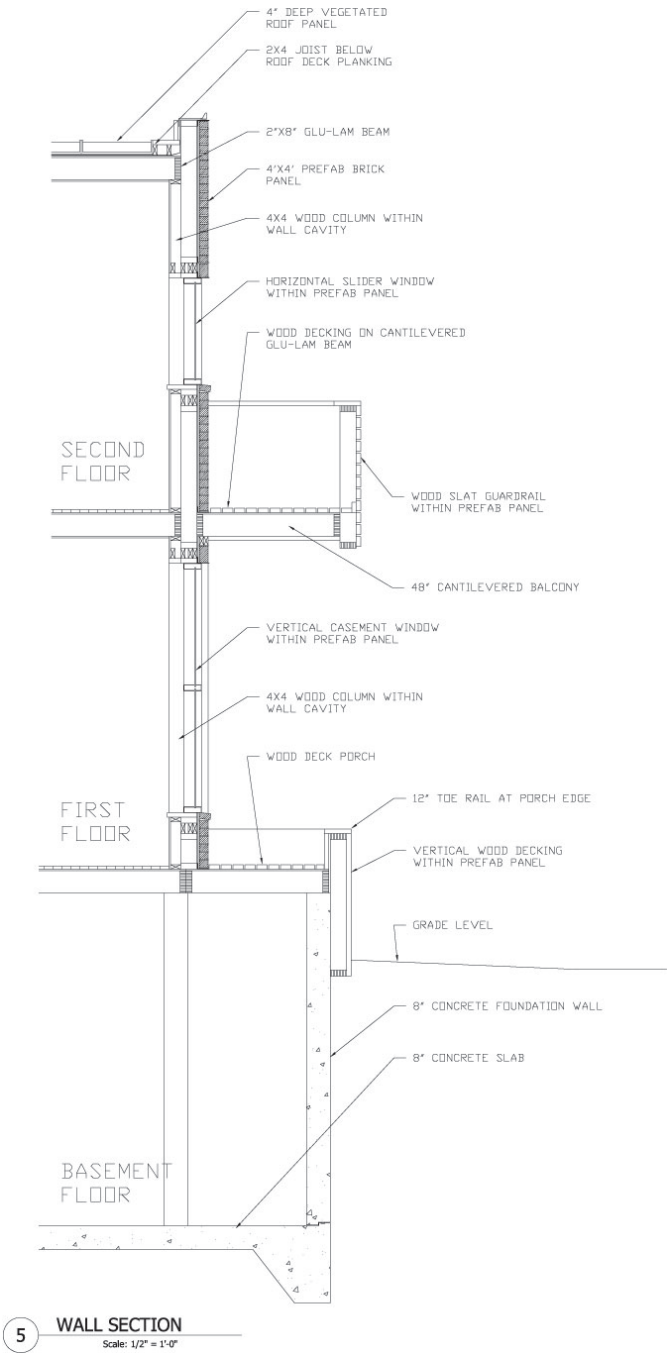
Energy and Atmosphere Summary

This section of the LEED For Homes™ rating system addresses the importance of maintaining a secure building envelope to prevent energy loss from the home and also specifies steps one can take on the interior of the home to promote energy efficiency. There are a total of 34 points possible for this section and the preliminary design laid out in this document has succeeded in achieving 16 of those points. With a larger budget it could be possible to gain more points, although it is unlikely that would be necessary. The main areas where the proposed design earned points in this category was by installing high-quality insulation (we chose Icynene, a spray form of insulation), using ENERGY STAR rated windows, lights, and appliances, and by concentrating the plumbing core at the center of the home to minimize the necessary piping and reduce water-heating costs. The compact design of this home has aided in the capabilities for energy-efficient living.

Indoor Environmental Quality

This is the final LEED for Homes category in which we propose to earn credits. The intent of the this category is to improve the overall quality of the home's indoor environment. The is mainly achieved through a prescribed method set out by the US Environmental Protection Agency's ENERGY STAR. The prescribed method is called ENERGY STAR with Indoor Air Package. The specifications in this package set forth a complete list of better standards for building construction which lead to improved indoor air quality. For example, Moisture Control through capillary breaks helps reduce the growth of mold, a common air contaminant in many traditional homes. A complete list of the specifications for the Indoor Air Package can be found in Appendix B-EQ1. Improving the overall indoor air quality in a home can reduce health problems such as allergies, headaches, and other respiratory problems. By using ENERGY STAR's Indoor Air Package and gaining additional credits with components such as better ventilation, air filters, and indoor contaminant control, we propose that 19 of 21 credits could be earned in this category.

Architectural Drawings and Documentation



5 WALL SECTION
Scale: 1/2" = 1'-0"

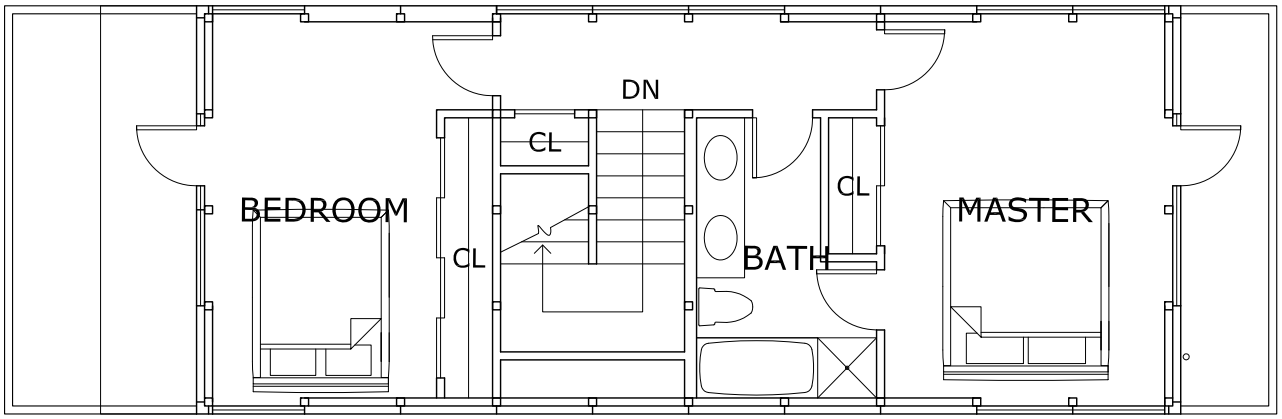
The proposed 3 bedroom, 2 storey Prefab design offers a number of features including:

- Low environmental impact
- Vernacular Style: Shot-gun
- Local materials with custom options
- Sensitivity to the neighborhood, with similar roof height

The layout focuses the more public programs on the street level, while private spaces are placed on the second level or towards the rear of the home. The Prefab design allows for customized layouts. The narrow shotgun style home and open floor plan allow for maximum cross ventilation. Additionally, stainability is achieved through reducing plumbing line runs by concentrating the plumbing wall at the center of the home. Central vertical circulation facilities shorter corridors and easy movement through the space.

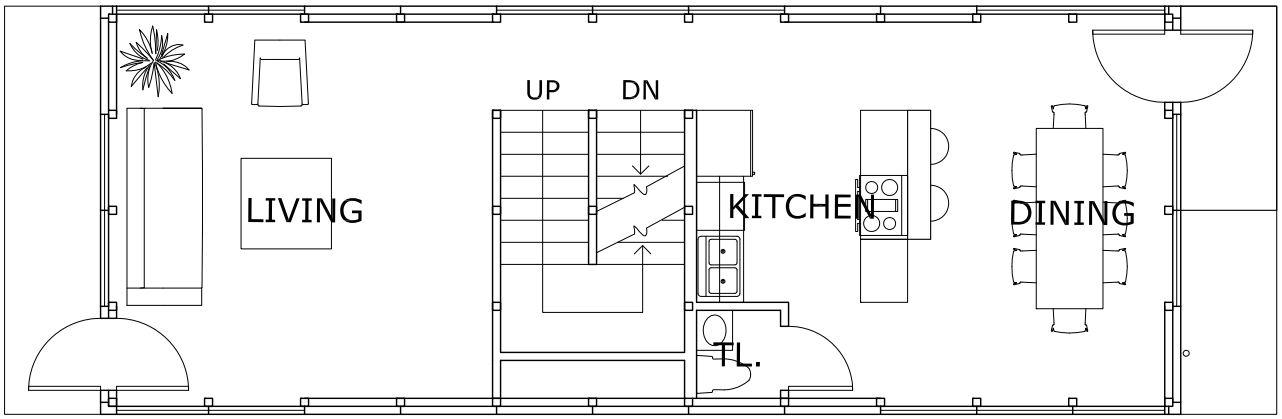
Alternate floor plan layouts can be found in Appendix B, these options include:

- ADA option
- One storey option
- Townhome option



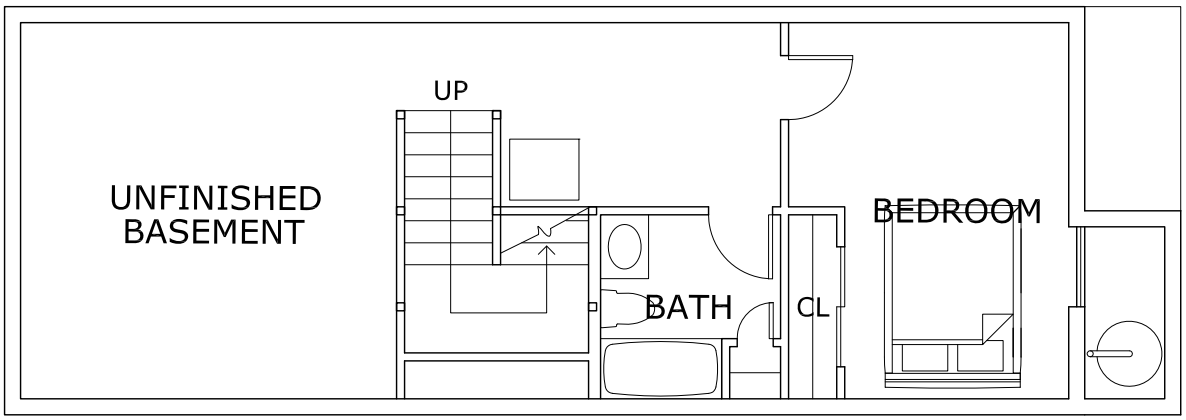
5 SECOND FLOOR PLAN

Scale: 1/8" = 1'-0"



4 FIRST FLOOR PLAN

Scale: 1/8" = 1'-0"



3 BASEMENT FLOOR PLAN

Scale: 1/8" = 1'-0"

BARTMER AVE ELEVATIONS

CREST AVE ELEVATIONS

Business Proposal

Traditional vs. Sustainable Development

Traditional development is comprised of four main elements: land costs, building costs, benefits, and the economy. Some benefits to consider for a development are potential tax breaks, TIFs, historic tax credits, and Brownfield tax credits. Factors that can make the economy favorable are a strong market and job growth.

For the University City development, additional options were evaluated in order to make the project sustainable. In this case, there were no land costs; the City already owns the land to be developed. Since this is a green project, consideration was placed on the type of building materials such as wood vs. brick, whether or not materials were local or recycled, and how waste could be reduced. This green project also allowed us to visit other financing benefits like Energy Efficient Mortgages (EEM) and tax abatements. For this investment, a platinum LEED certified home would qualify for an EEM and as well as an eight year tax abatement. A complete listing of St. Louis area lenders who specialize in EEM is located in Appendix C-EEM Lenders. Furthermore, environmental issues are prevalent in our economy and have grabbed the attention of many people. In order to help the environment, people are looking for more environmentally friendly options in their day-to-day lives. This green home is exactly that.

One of the easiest ways to demonstrate the cost effectiveness of a sustainable development is to compare and contrast traditional vs. Energy Star labeled appliances. An Energy Star furnace, for example, costs $320 more than a standard furnace. Over the life cycle of the furnace, the net savings to the consumer is $1,711. This translates to 247 kWh of energy saved over the life cycle of the furnace. The air pollution reduction per year is equivalent to removing three cars from the highway and saving four acres of forest. The tables below summarize the life cycle cost estimates for various Energy Star products. Full specifications for each product can be found in Appendix C-Energy Star Life Cycle Cost Estimates.

Energy Star Life Cycle Cost Estimates

	Dishwasher	Compact Fluorescent Lamp	Programmable Thermostat	Refrigerator	Freezer
Initial cost difference	$ -	$ 3	$ 19	$ 30	$ 33
Life cycle savings ($)	$ 207	$ 65	$ 2,350	$ 70	$ 68
Net life cycle savings ($)	$ 207	$ 62	$ 2,331	$ 40	$ 35
Payback of additional cost (years)	-	0.30	0.10	4.30	4.30
Life cycle energy saved (kWh)	848	450	201	934	879
Life cycle air pollution reduction (lbs of CO_2)	1,301	691	29,057	1,434	1,349
Air pollution reduction (# of cars per year)	-	0.06	3.00	0.13	0.12
Air pollution reduction (acres of forest)	-	0.09	4.00	0.18	0.17
Savings as a % of retail price	38%	1767%	2534%	4%	10%

	Ceiling Fan	Clothes Washer	Furnace	Boiler	Heat Pump
Initial cost difference	$ 86	$ 200	$ 320	$ 900	$ 1,000
Life cycle savings ($)	$ 203	$ 402	$ 2,031	$ 1,961	$ 2,547
Net life cycle savings ($)	$ 117	$ 202	$ 1,711	$ 1,061	$ 1,547
Payback of additional cost (years)	3.40	4.36	2.00	6.20	3.70
Life cycle energy saved (kWh)	1,513	284	247	215	33,550
Life cycle air pollution reduction (lbs of CO_2)	2,322	436	28,838	25,153	51,499
Air pollution reduction (# of cars per year)	0.20	0.04	3.00	2.00	4.00
Air pollution reduction (acres of forest)	0.30	0.05	4.00	3.00	6.00
Savings as a % of retail price	42%	40%	156%	19%	23%

	Total
Initial cost difference	$ 2,591
Life cycle savings ($)	$ 9,904
Net life cycle savings ($)	$ 7,313
Payback of additional cost (years)	2.87
Life cycle energy saved (kWh)	39,121
Life cycle air pollution reduction (lbs of CO_2)	142,080
Air pollution reduction (# of cars per year)	12.55
Air pollution reduction (acres of forest)	17.79
Savings as a % of retail price	45%

As illustrated above, the cost benefits of using Energy Star appliances outweigh those of standard appliances. The initial investment of $2,591 can be made back in just 2.87 years and the net life cycle savings is $7,313. That removes 12.55 cars from the highway and saves nearly 18 acres of forest each year. Additionally, over 39,000 kWh of energy is saved over the life cycle of the appliances.

Proposed Budget

Using the actual development budget from an EcoUrban platinum LEED home in St. Louis, we were able to modify the budget to meet our specifications.

LEED PLATINUM PROPOSED BUDGET DEVELOPMENT COSTS	**SIZE 1550 sq. ft.**
Construction Management	10,000
Construction Site Work ($63/ sq. ft.)	97,650
Engineering, Survey and Soils	1,500
Module Construction ($45/ sq. ft.)	69,750
Appliances	9,000
Backfill, Landscaping, Porches, Awnings	7,500
Interior Painting	1,500
Construction Interest Reserve	3,000
Construction Loan fees	1,500
Title, recording and disbursing	1,000
Construction Period Insurance	500
Construction Period Taxes	500
Marketing & Sales	1,500
Legal - Organization/Real Estate	2,500
LEED Certification	2,000
Contingency Reserve (5%)	4,883
Total Development Costs	**214,283**

The development costs for a sustainable development can differ from a traditional development. According to HousingEconomics.com, the average construction cost per square foot for a new one-family home in the Mid-west was $88 in 2007. Additionally, the average square foot per new one-family home built in the Midwest was 2,257. For a year-by-year analysis, please see Appendix C-HousingEconomics.com.Here are some ways to reduce the costs of a sustainable development. Reducing the square foot of the foundation can cut costs $200 per foot. Additionally, reducing the footprint of the home and exploring ways to make the basement more functional per square foot saves in concrete, rebar, waterproofing, excavation, and hauling. Another area for savings is the exterior; a platinum certification can still be obtained with a very simple fiber cement lap siding versus a more interesting or visually pleasing exterior.

Law Proposal

Legal Issues and Related Recommendations

Property Rights

Land Conveyance and Clear Title

Because University City acquired the five lots for the project through condemnation, it should perform a thorough search of the title history before conveying building upon or attempting to convey the property to another party. The search will identify easements, covenants, liens, and other encumbrances and title defects and help avoid potentially costly problems in the future. Defects of title that cannot be removed by the city may place limits on where the LEED homes may be built and may make the project less economical for all parties involved. A simple title search would significantly reduce, if not eliminate, the likelihood of any such problems arising, thereby facilitating the development and attractiveness of the five LEED Platinum homes.

Negative Solar Easement

Since the LEED certified homes being developed in this project are located next to property which University City currently has not acquired at this point, developers and homeowners need to consider the legal issues that may arise if an adjoining landowner builds, remodels, or landscapes their property in such a way that will prevent the LEED homeowners from utilizing sunlight for the purpose of generating solar energy.

State and Federal Law

A number of federal and state courts have considered the rights of a landowner against interference by another, generally an adjoining landowner, with sunlight to be used for the purpose of generating solar energy. 29 A.L.R.4th 349. Since solar energy generating systems require open and unobstructed use of the available sunlight, thus potentially interfering with development of nearby land, a number of states have enacted statues governing the rights of access to sunlight. *Id.* Missouri has alternatively addressed this issue by setting forth terms that must be included in an easement obtained for the purpose of exposure to a solar energy device. *See* RSMo 442.

Under RSMo 442.012, the *right to utilize solar energy is a property right* but eminent domain may not be used to obtain such property right. The requirements for creating a solar easement are as follows:

Any easements obtained for the purpose of construction, reconstruction, remodeling or acquisition of a solar energy devices shall only be created in writing and shall be subject to the same conveyance and instrument recording systems as other easements. Any instrument creating a solar easement, shall include, but is not limited to: The vertical and horizontal angles, expressed in degrees, at which the solar easement extends over the real property subject to the solar easement and any terms or conditions or both under which the solar easement is

granted or will be terminated. Easements for solar light shall be considered negative easement[1] and cannot be acquired by prescription but must be *negotiated expressly*. *RSMo, 442.012.2*

There are a number of potential legal claims that may be brought by landowners who have had their access to sunlight restricted by adjoining landowners.[2] In *Prah v. Maretti*, 108 Wis. 2d 223, 312 (1982), the court held that the use of property by a landowner so as to interfere with the sunlight needed for the purposes of solar energy by another landowner could constitute a *private nuisance*. After speaking with Lois Sechrist, a certified LEED consultant, it is our understanding that this seems to be the most common claim brought by landowners in the St. Louis area who have had their access to sunlight restricted by adjoining landowners.

Recommendations:

In light of this project's potential use of solar energy panels to heat the LEED homes developed by the architect students, access to solar energy should be a factor that University City considers when amending University City's zoning regulations and building codes in the future. 14 Land and Water L. Rev 393, 395 (1979); 10 NM L Rev 121 (Winter 1979).) In addition, University City should consider educating local homeowners, as well as potential LEED homeowners of the aforementioned issues in efforts to prevent potential lawsuits or disagreements between University City property owners. University City should explain to property owners the need to expressly negotiate for negative solar easements, pursuant RSMo 442.012, if they intend to use solar energy in their homes. Finally, if University City is able to acquire more homes directly next to one another, it may be able to prevent solar energy issues from arising by ensuring that none of the LEED homes have restricted sunlight access.

Regulatory and Land Uses

Zoning Codes

The project lots are located in University City's "Limited Residential" zoning district. This designation has three separate implications for the project. First, Section 34-31.5(1)(a)(1-2) of the University City Zoning Code require a minimum lot area of 6,000 square feet and a minimum lot width of 50 feet. The lots that are to be used in this project fail to meet both of these requirements. Under Section 34-53 of the Supplementary Regulations, however, an exception to these regulations will be granted if the following are conditions met: 1) the lot size is smaller than 4,500 square feet and 37.5 feet in width; 2) the lot meets the prevailing pattern of the subdivision in which it is located; and 3) the lot is within an established subdivision where development is on lots of the same size or smaller. Second, Section 34-31.5(2)(a)(1-3) establish the minimum building setbacks as follows: Front yard: 20 feet; Side yard: 5 feet; and Rear yard: 25 feet. Due to these regulations, the "buildable area" of the lot

1 Easements are categorized as being either *affirmative* or *negative.* In general, an *affirmative easement* is a nonpossessory right to use land in the possession of another. For example, if A owns an easement that allows her to travel over land owned by B, A holds an affirmative easement. In contrast, a *negative easement* entitles an owner to prevent another owner from doing a particular act on the second owner's land.
http://legal-dictionary.thefreedictionary.com/easement; http://www.lexisnexis.com/lawschool/study/outlines/html/prop/prop32.htm.

2 *See* Energy Rights Memo for further explanation of potential claims.

is only a 20' x 101' space. Section 34-55.4 adds another layer of complexity by requiring that corner lots have a front yard (20' setback) on each side facing a street. Finally, Section 34-31.5(3) limits building height to three and one half stories or 35 feet, whichever is less. Here, the design team has proposed a building height that is well within these limitations.

Recommendations:

To avoid a problem with the minimum lot size and width requirements, a developer should apply for an exception with the zoning administrator. Here, the project lots clearly meet the three conditions for an exception set forth in the zoning code. As a result, the zoning administrator must grant the exception and allow the developer to build on the small lots.

For three of the five lots in the project, compliance with the setback regulations is not a problem. The homes, as designed, fit within the "buildable area" of the lots. However, on the remaining corner lots compliance with Section 34-55.4, combined with the standard setbacks, would leave only 5' in width in which to build a home on the corner lot involved in this project. As a result, a developer should apply for a variance with the zoning administrator, asking for reprieve from this rule. If the variance request included information such as the prevailing pattern of development in the neighborhood and the small size of the lot, then the City would probably be willing to grant the request.

Problems with the building height restrictions contained in the zoning code are not anticipated. Both maximum measures of height are very generous and anything beyond their limitations would probably not fit well with the existing structures of the neighborhood. Further, the team has designed a structure that is well below the maximum height allowable.

Building Codes

University City uses the 2003 International Building Code, as amended by ordinances, as its building standard. This code takes a neutral stance on green building; it neither rewards nor disciplines builders for their use of LEED or other green principals. Once a green program, such as LEED, has been selected, however, all building components must meet the requirements set forth in the code. Because sustainable building practices often use components of the highest quality, all indications are that the materials themselves meet or exceed the standards set forth in the code.

Recommendations:

As long as they are designed properly and their components are installed correctly, the LEED homes will have no problems meeting the requirements set forth in University City's building code. In order to err on the side of caution, however, a developer will always want to have a professional that is familiar with University City's building codes on the design team or, at least, inspect the final design specifications to ensure that they are up to code.

Financing

Tax Abatements

University City has the authority to grant tax abatements pursuant to the Real Property Tax Increment Allocation Redevelopment Act as codified in RSMo 99.700. The project homes on Bartmer and Crest seem to qualify for tax abatements pursuant to RSMo 99.700.

Under Chapter 99.700 RSMo, any party can seek abatements of real estate taxes in a constitutional charter city having a Land Clearance for Redevelopment Authority (LCRA). University City is a constitutional charter city and does have an LCRA in place. In order to qualify for tax abatements under RSMo 99.7000, the area subject to the tax abatements must be considered "blighted," and a study indicating such findings must be prepared. Under RSMo 99.020.3, a "blighted area," is an "area which, by reason of the predominance of defective or inadequate street layout, insanitary or unsafe conditions, deterioration of site improvements, improper subdivision or obsolete platting, or the existence of conditions which endanger life or property by fire and other causes, or any combination of such factors, retards the provision of housing accommodations or constitutes an economic or social liability or a menace to the public health, safety, morals, or welfare in its present condition and use." For the most part, blighting studies have already been completed on Bartmer and Crest.

Once the blighting study has been completed, it goes before the LRCA council for passage of an ordinance designating the real property as blighted and qualifying the property for tax abatements. RSMo 99.700. Although getting the ordinance passed will take some time, the process should go smoothly given the fact that the blighting study has already been done. Finally, with respect to granting tax abatements for a period of 8 years, University City has already come to an agreement that they can offer tax abatements for 8-10 years.

Benefits of Tax Abatements

Given that the area surrounding Bartmer and Crest does not qualify redevelopment area, University City is very limited in terms what types of funding or financing options they can offer. Offering tax abatements are the best route for this project because 1) attracts buyers 2) it lessens their mortgage payment allowing the developer to spend more and build a better house. Offering tax abatements results in only a miniscule loss by University City. Furthermore, if this spurs more growth in the future, University City will benefit in the long term.

Recommendations:

While tax abatements may be the most feasible option for financing this project on a small scale, if this project is expanding to include low income or affordable housing, or is deemed to be a "redevelopment area" under Missouri Statute, University City may qualify for a variety of other funding options and financial incentives.[1]

1 *See* Memos on Alternative Financing Options, Low Income Housing Tax Credit, TIF.

Energy Efficient Financial Incentives

A potential selling point for this particular LEED project includes energy efficient tax

credits, loan and mortgage programs, as well as private incentives surrounding renewable and efficient energy on both the state and federal level. Many of these programs are designed to provide incentives for residential homeowners to utilize renewable energy systems throughout their home. Please refer to the following Memos for further information regarding the aforementioned incentives: Energy Efficient Tax Credits, Missouri Incentives, and Federal Financial Incentives.

Recommendations:

Given the lengthy, complex, and time consuming nature of the application process for many of these incentives, the aforementioned incentives may be a much stronger selling point if University City expands this project in the future.

Political Issues and Recommendations

Sustainable Development

Present: LEED Accredited Homes

As sustainable practices in general, and LEED Accredited projects specifically, grow in popularity and recognition around the nation, the city's foresight in trying to implement such practices should serve to increase the city's political capital. As already shown in this RFP, constructing a LEED home will serve to benefit the individual homeowner in terms of a longer product life and healthier home environment. Likewise, instituting LEED practices on a city-wide scale will benefit University City in less tangible yet important ways. As a brand known nation wide, having LEED Accredited Homes in University City will attract green minded homeowners to the area. Furthermore, since University City is one of the first to implement such policies, advocating LEED construction will enable University City as a municipality to stand out as an environmental leader in the Saint Louis area.

Future: Transit Oriented Development

In addition to the five proposed LEED homes, there are other ways for University City to continue to be a leader in sustainable development. The area surrounding the Wellston metro stop is a prime area for transit oriented development (TOD), a concept that shares many of the same goals and concepts as LEED certification. TOD has been proposed as a future goal for University City in a possible collaboration with Wellston. The area around the Wellston metro stop is a ten minute walk from the proposed test block for the five LEED homes. In addition, there are many vacant areas surrounding the stop itself which would be ideal for mixed use and commercial development. One of the main goals of TOD is to decrease use and reliance on automobiles. Decreasing reliance on automobiles is a key step in reducing carbon emissions, which in turn curbs the global warming effect, also a main LEED goal. Introducing TOD in the area would greatly contribute to the upkeep of LEED ideals and establish University City as a sustainable area.

Recommendations:

In the interest of cost and the potential failure to receive all the projected points, University City might want to consider relaxing the certification level a developer is required to meet. Even lowering the standard required by one level could substantially affect price.

To further encourage sustainable development in University City in the future, the city's authorization and support for a LEED Certified Pilot Project, like the project currently in the works, should spur the future use of LEED in University City. Once developers have a model to reference and see the project's economic viability, they will be more likely to pursue like projects. The city could also pass a law requiring all new and remodeled government buildings to meet a certain level of LEED certification.

Furthermore, the city has a number of other areas where sustainable development projects could be pursued. The city could, in conjunction with Wellston, pursue transit oriented development situated around the Wellston metro stop. The city could also look into further developing the Mt. Vernon – Olive area as a mixed use development.

Government Entities

Since local municipal governments maintain primary control over development occurring in their boundaries and University City strongly supports this green development project, a developer should not face any opposition from the city so long as the developer builds according the LEED plan specifications. In fact, considering the vested interest University City has in seeing this project succeed, the developer should enjoy considerable support from the city in terms of smooth passage through necessary administrative procedures as well as direct marketing assistance. Thus, traditional developer concerns regarding lengthy government review and permitting procedures should not be an issue.

Recommendations:

To assist a developer in constructing the LEED certified homes, University City could assure the developer an expedited permitting process and fee rebates. The city could also consider assisting the developer and homeowner with obtaining LEED certification. Furthermore, the city could offer to direct marketing assistance by promoting the development on the city's webpage and in city material. University City could also help verbally promote the development at meetings and to interested media persons. The city could also propose to relax their signage laws so the developer is able to more ably market the properties himself.

Gentrification

At first glance the considerable difference in existing and newly constructed home prices would seem to signal a concern for possible gentrification of the neighborhood and current resident resistance to the development. This is not the case. In fact, University City has reportedly received an overwhelmingly positive response from current residents to the potential development. Residents believe placing homes on the lots that currently sit vacant is in the best interest of the neighborhood as a whole. Furthermore, since the current development project only encompasses five empty lots, it is unlikely to lead to a large scale move toward gentrification of the area.

Recommendations:

Just as University City has already spoken with some of the current residents to discuss the development prospects, the city should make sure to keep current residents informed and when possible, request their input and suggestions. The more University City collaborates with current residents and does not alienate them, the greater the chance the project has for success.

Summary

How The Recommendations Interact With Each Other And Constitute An Integrated Proposal For Change

Sustainable development requires a high degree of collaboration and foresight from all involved parties and in turn offers greater benefits than traditional construction. LEED design not only strives to protect the environment, it can also provide homeowners with a healthier living environment and longer lasting products. LEED seeks to incorporate sustainable practices into all phases of the design process; therefore the proposed recommendations suggest ways to institute LEED practices at each stage of the construction process.

The proposed legal and political recommendations offer ways the city could market the project to developers and homeowners. Altogether the recommendations suggest means of directly assisting developers and homeowners by conveying the land free of encumbrances, potentially modifying existing zoning codes and offering various financial incentives. The design offers a plan and recommendations for the developer constructing the LEED homes, noting how the developer can achieve alternative green practices. Finally, a number of the recommendations focus on how University City might incorporate other sustainable development practices in the future.

All together, the proposed recommendations offer University City a way to collaborate with developers and homeowners to build a greener city.

Epilogue

Urban Planning Team

As the only urban planning student, I also felt initially intimidated. While the architecture students began working on a design model and the law students began looking at the legal issues associated with the project, I felt unsure as to how I should contribute. I felt as if there were some planning/policy issues that were relevant to our project, such as proposing such an expensive home in a neighborhood of such modestly priced homes. Unfortunately, I felt by bringing this up that I was in some way dragging the group down. As time went on though, I thought we were able to incorporate this issue in an appropriate manner, such as suggesting alternative possibilities for the vacant lots on our test block. In addition, I thought the design team did an excellent job of creating a $200,000, modern home that was harmonious with the existing neighborhood. I thought that I was able to lend some perspective to the larger neighborhood revitalization effort as well.

Overall, I thought our team worked quite well together. I was impressed by the effort put forth from all of the different perspectives, and it was a privilege to work on a project such as this. It was a good learning experience, and I gained a better understanding of how complicated real projects such as these are, and how various different disciplines come together to form a cohesive presentation.

Design Team

Overall, the LEED for Homes ™ rating system provides thoughtful design guidelines for sustainable residential design. While some of the points acquired in the home design were acquired from existing conditions (i.e., urban location), the LEED Platinum certification is important in creating awareness to the home and its overall marketability. Additionally, having a budget of $200,000 made achieving the Platinum status a challenge, as we were not able to afford high-end fixtures and appliances, in addition to off-the-grid energy and grey water systems. Having said that, we were able to strategies which areas of the LEED checklist would gain us the most points for our money. The LEED Home Size Adjustment (see Appendix) allowed us to lower our required Platinum points from 90 to 84.5 by making an efficient home with minimum square footage required.

Business Team

Being the only business student in a classroom of urban design, architecture, and law students was initially overwhelming. It seemed I had gotten in over my head and I was unsure of how I would be able to actively contribute to the University City project. Partnership with the architecture students allowed me to learn a great deal about the designing aspect of the project and enabled me to research key financial components of the project as they came up.

Given the price point of under $200,000, the business team had to be very cautious of project spending. The attainability of some LEED points was determined solely on price. With the help of EcoUrban Design, the team was able to come up with a realistic budget that met most of University City's needs.

Overall, I thoroughly enjoyed working with a variety of students from different disciplines. Our University City

development came together like a puzzle, with each discipline contributing a unique piece. I have learned a great deal about University City and the St. Louis metropolitan area and feel that I have the initial foundation to make an impact in my community.

Legal Team

Being a part of this proposal gave the legal team a new perspective on how law interacts with other disciplines to accomplish clients' objectives and best serve their needs. Unlike law school where students predominantly work on their own, this proposal required collaboration at every stage of the process both with members of our team and with the group as a whole. When we first began to work on the proposal it was difficult for us to understand our part in this collaborative process, yet over time through a series of group meetings and lectures, we were able to see how our role as legal advisors fit into the big picture. This experience is invaluable to us as it showed us that law does not operate in a vacuum, but rather requires interaction and collaboration with other lawyers and other disciplines. Thus, we would like to extend our heartfelt thanks to our professors, our group members and to Petree Eastman and Lois Sechrist for giving us this opportunity and helping us each step along the way.

Appendix A - General

EcoUrban LEED Platinum Home Visit

- Fiber cement cladding
- Massing relates to surrounding context
- Native landscaping and rain garden
- Added brick element to combine with local material
- Not ADA accessible—ramp would take too much space in narrow lot
- Market price= $205,000 ($300,000 budget)/ construction costs
  - ➔ $10,000 furnishing
  - ➔ 3rd bedroom in the basement
  - ➔ Garage/ storage added on extra costs
  - ➔ Marketing $$$
- Modular manufacturing cost $45/ sq. ft. (75% complete)
  (still needed primer paint and drywall)
- 5 days to manufacture
- 400 lbs. of total construction waste (average 3-5 sq. ft. verses 25 sq. ft.)
- 15’-9” width of structure with 1’ overhang/ 68’ length
- L-shape brings some design aspect

- Crawl space instead of basement? Excavate pier system
- 1600 sq. ft. above ground
- Basement bedroom needs egress, window (34" above finished floor), & closet
- Saved $ on energy efficiency (countertops verses flooring)
  - ➔ Bamboo flooring
- Acquired points through LL part of LEED due to urban setting

Mechanical

- Heat pump ($7500 installation)
- Electric back-up furnace (Gas backup?)
- Tankless gas direct water heater
- On-site point of use utilities (Merv filtration system- Merv 13 filter)
- Icynene foam – petroleum product, high R-value (50% more expensive)
- $75 for monthly utility bills
- Casement windows for cross-ventilation? Capture nominal winds (load windows south and east)
- R-40 insulation in roof
- Water→ 1.2 gallon flow/ minute (low-flow faucet)
- 9' ceilings
- Anderson 400 series quaker windows (.33 U-factor)
- Prewired for solar panels (future proof)
- Point of use sink connected with toilet (reuse grey water)
- Drought tolerant plants
- Thermax basement insulation
- Backfill foundation with rock keeps water out
- Harmony Paint (low VCs)
- Airtight ventilator brings in air (IEQ issues)
- Trex decking
- More $ on mortgage for energy efficiency

$200,000 LEED PLATINUM

PROPOSED BUDGET

DEVELOPMENT COSTS

SIZE

1100 sq. ft.

	ORIGINAL BUDGET	APPROVED CHANGES	REVISED BUDGET	PAID TO DATE	THIS REQUEST	REMAINING BALANCE
SOURCES						
Equity	$20,000.00	$0.00	$20,000.00	$0.00	$0.00	$20,000.00
Construction Loan	$160,000.00	$0.00	$160,000.00	$0.00	$0.00	$160,000.00
Total Sources	$180,000.00	$0.00	$180,000.00	$0.00	$0.00	$180,000.00
USES						
Property Acquistion	$2,500.00	$0.00	$2,500.00	$0.00	$0.00	$2,500.00
Construction Management	$10,000.00	$0.00	$10,000.00	$0.00	$0.00	$10,000.00
Construction Site Work	$70,000.00	$0.00	$70,000.00	$0.00	$0.00	$70,000.00
Architectural Design	$7,500.00	$0.00	$7,500.00	$0.00	$0.00	$7,500.00
Engineering, Survey and Soils	$1,500.00	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
Module Construction	$50,000.00	$0.00	$50,000.00	$0.00	$0.00	$50,000.00
Kitchen Countertops & Cabinet Upgrade	$5,000.00	$0.00	$5,000.00	$0.00	$0.00	$5,000.00
Appliances	$5,000.00	$0.00	$5,000.00	$0.00	$0.00	$5,000.00
Backfill, Landscaping, Porches, Awnings	$7,500.00	$0.00	$7,500.00	$0.00	$0.00	$7,500.00
Interior Painting	$1,500.00	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
Construction Interest Reserve	$3,000.00	$0.00	$3,000.00	$0.00	$0.00	$3,000.00
Construction Loan fees	$1,500.00	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
Title, recording and disbursing	$1,000.00	$0.00	$1,000.00	$0.00	$0.00	$1,000.00
Construction Period Insurance	$500.00	$0.00	$500.00	$0.00	$0.00	$500.00
Construction Period Taxes	$500.00	$0.00	$500.00	$0.00	$0.00	$500.00
Marketing & Sales	$1,500.00	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
Legal - Organization/Real Estate	$2,500.00	$0.00	$2,500.00	$0.00	$0.00	$2,500.00
LEED Certification	$2,000.00	$0.00	$2,000.00	$0.00	$0.00	$2,000.00
Contingency Reserve (10%)	$7,000.00	$0.00	$7,000.00	$0.00	$0.00	$7,000.00
Total Development Costs	$180,000.00	$0.00	$180,000.00	$0.00	$0.00	$180,000.00

Questions & Comments from November 20th, 2008 U-City Presentation

1) Have ADA requirements been considered?
    a. Yes, the modular design allows for flexibility in the floor plan. So, the design that was presented today is one version, we'll include the optional plans with the final document.
2) Per the presentation a project with a small scope is not eligible for Federal or State incentives, how would the project become eligible?
    a. The project would need to be considered on a much larger scale in order to become eligible, for example, incorporating more lots and possibly a townhouse development.
3) What is the price-point difference between the 5 LEED Platinum homes and a townhouse development?
    a. By increasing the density an economic advantage is gained for the city, and with more units there are more opportunities for affordable housing units. Additionally, the current estimate for the 5 homes is based on about $45/SF, increasing this to 30 units can bring that estimate down to $38/SF, based on information we received from ecoUrban.
    b. Follow-up question: Does the price-point consider the added cost of ongoing management, or a Neighborhood Association? Would that increase the cost?
        i. Further research required.
4) Legal Suggestion: The presentation implies that gaining LEED certification always increases the cost and building time; this issue warrants further investigation and clarification.
    a. The final document must state that any new project runs into the issue of guaranteeing false performance results, and that the marketing and contractual documents must not make any such guarantees. Additionally, the final document should suggest that any future RFP make the requirement that contractors and subcontractors ought to have knowledge of and experience in LEED certification.
5) What is the recommended consultation process with the existing community?
    a. Community meetings, design charrettes, and early education will benefit the community by direct interaction and provide knowledge.
6) Has the prototype design been developed in relation to the existing neighborhood?
    a. The main intent was to have an overall matched look, however, the Prefab design brings a modern touch to the neighborhood.
    b. Follow-up question: Was the roof line matched? There is no consistent roof line in the neighborhood, yet we did not build to the full 35' code allowed height.
    c. Follow-up question: Were LEED points determined according to cost? Yes, for example in the EA section we estimate that 16 of the 38 available points are feasible based on what our budget allowed.
    d. Follow-up question: Would the existing income level in this area find this design affordable? If the final estimate is about $250,000, then most of the existing population would not find this project affordable without financial assistance or

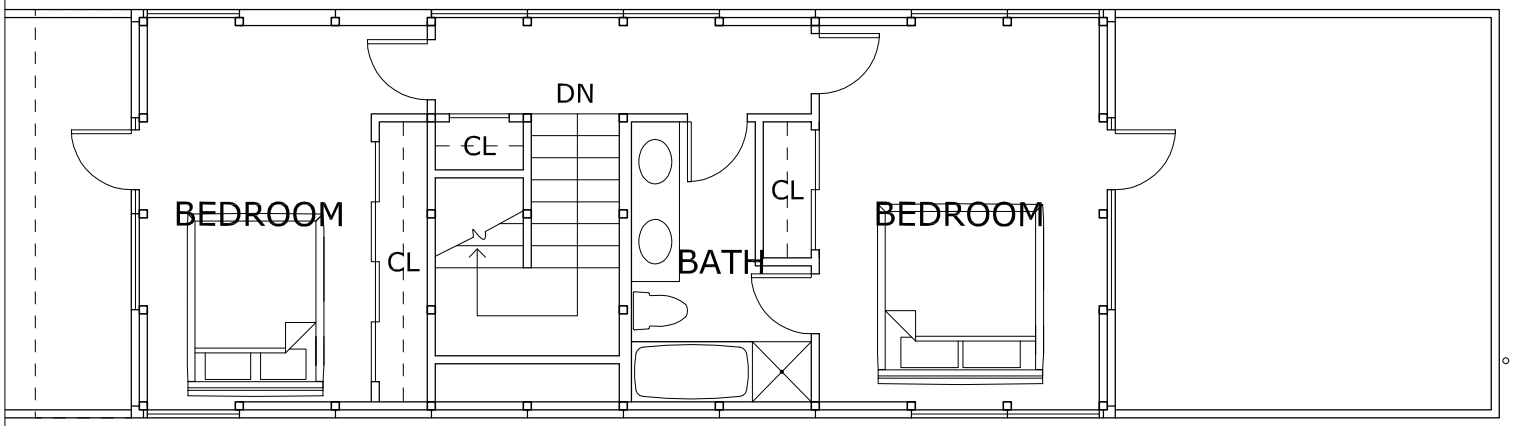
possibly utilizing a LEED mortgage loan. The LEED mortgage loan could be higher due to lower energy costs.

7) Since the estimated price is so high, is it true that either Platinum certification goes or incentives be received?
    a. There is also the option of subsidies, or financing thru banks that specialize in LEED homes.
8) Budget Suggestion: The estimated cost break-down for the LEED Prefab home would be better served by comparing it with traditional construction, for example what would be the difference in site work costs?
9) Many of the lots along Crest have smaller scale homes, have you considered a design option that fits in with the smaller scale?
    a. Yes, the flexibility of the design allows for many alternate options.
10) Has there been an analysis for the market of these types of homes?
    a. The current market is obviously struggling; however this specialized energy efficient housing strategy has the advantage of appealing to the market. So, the LEED label is an important component in today's market.
11) Has the issue of challenges in securing insurance for the sod roof and interior closed-loop greywater system been considered?
    a. Further research into insurable construction methods and building systems would be required.

Final Note: A cost comparison of traditional verses LEED construction must be included to show the bottom-line benefits.

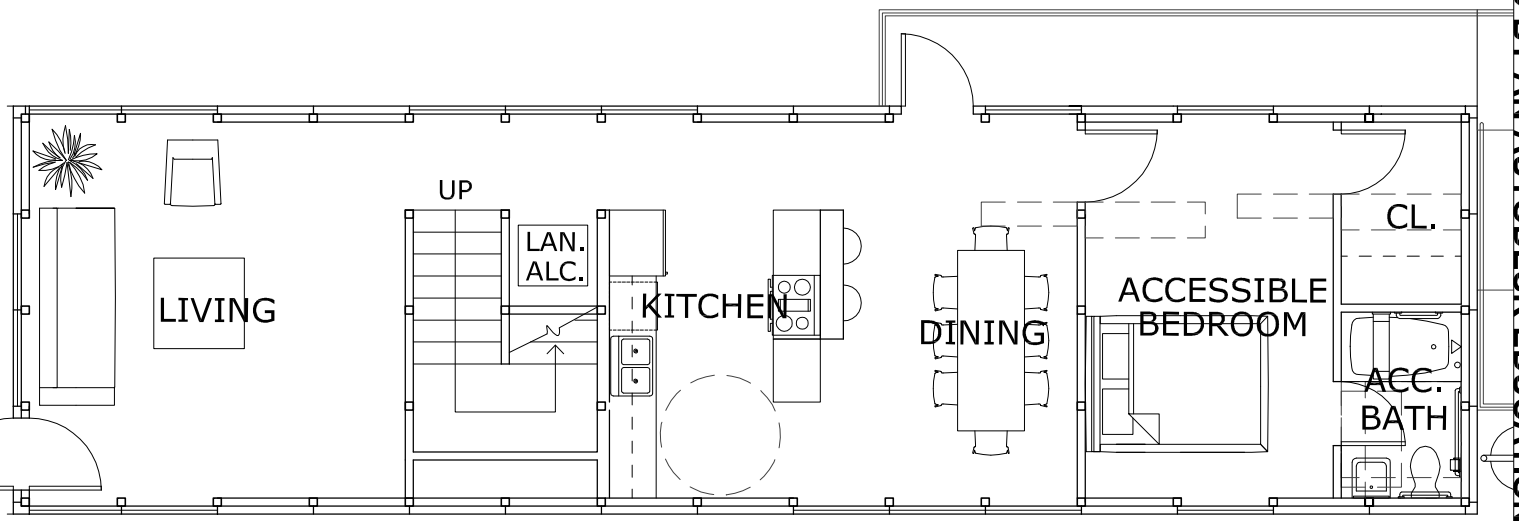
Appendix B - Architecture

B-ALTERNATE FLOOR PLAN LAYOUTS



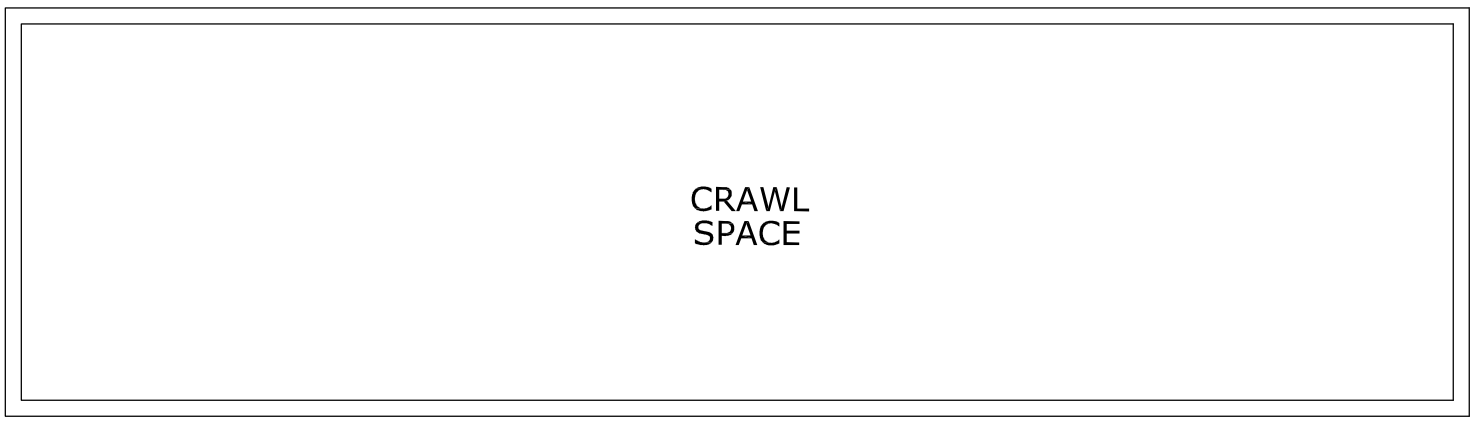
5 ADA SECOND FLOOR PLAN

Scale: 1/8" = 1'-0"



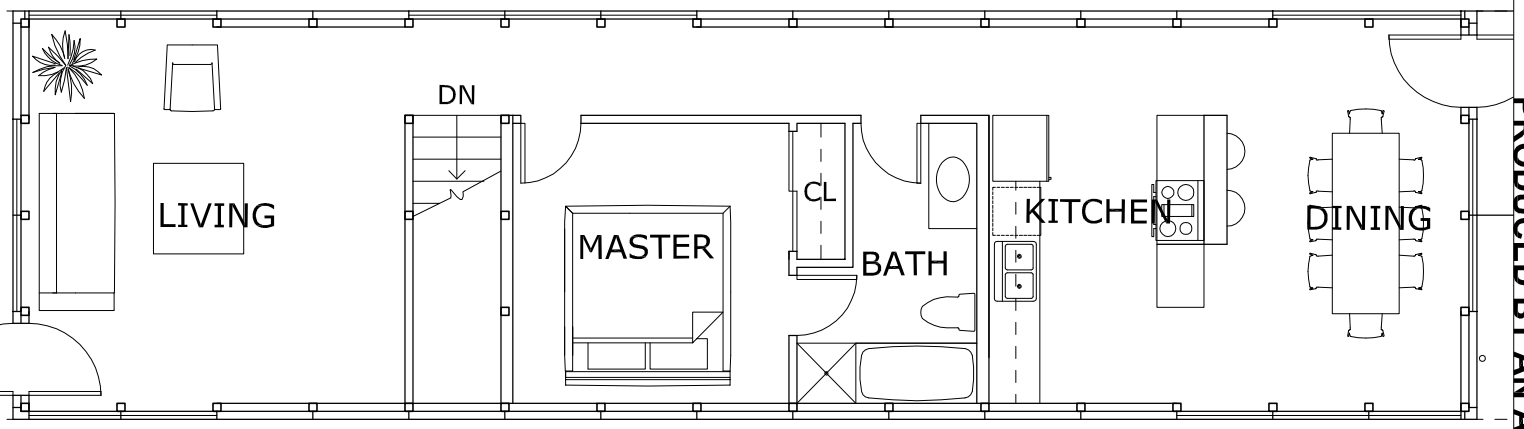
4 ADA FIRST FLOOR PLAN

Scale: 1/8" = 1'-0"



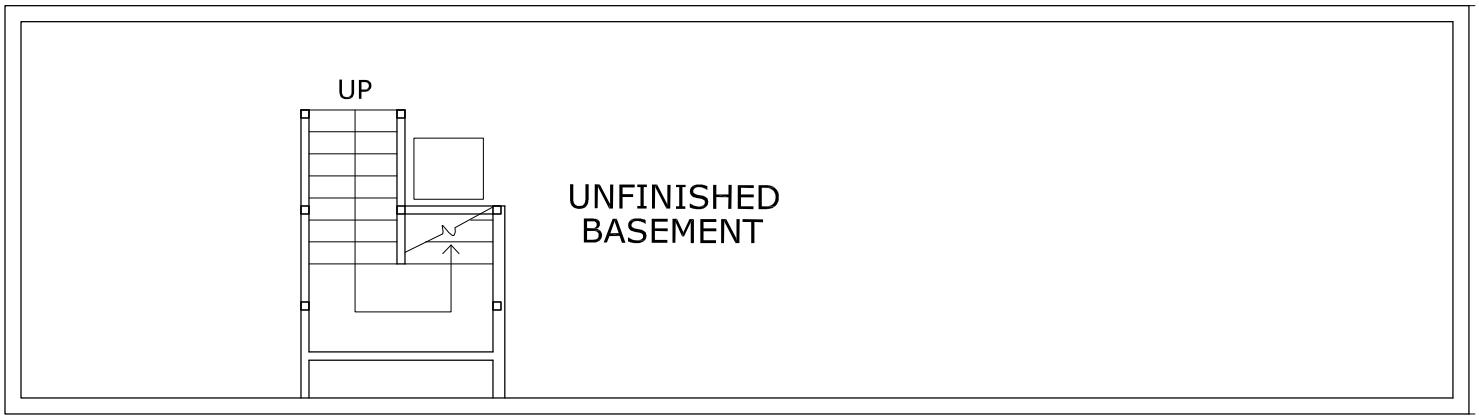
3 ADA FOUNDATION PLAN

Scale: 1/8" = 1'-0"



4 1 STOREY FIRST FLOOR PLAN

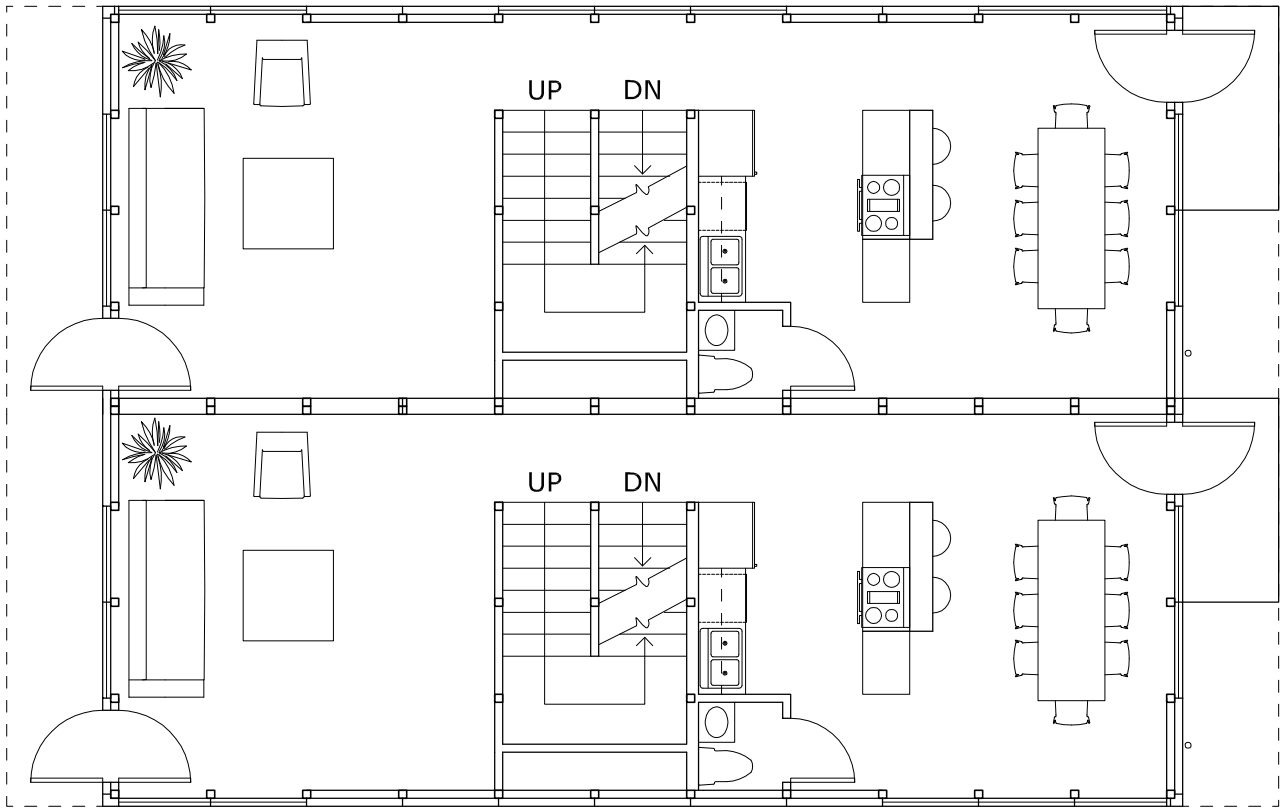
Scale: 1/8" = 1'-0"



3 1 STOREY FOUNDATION PLAN

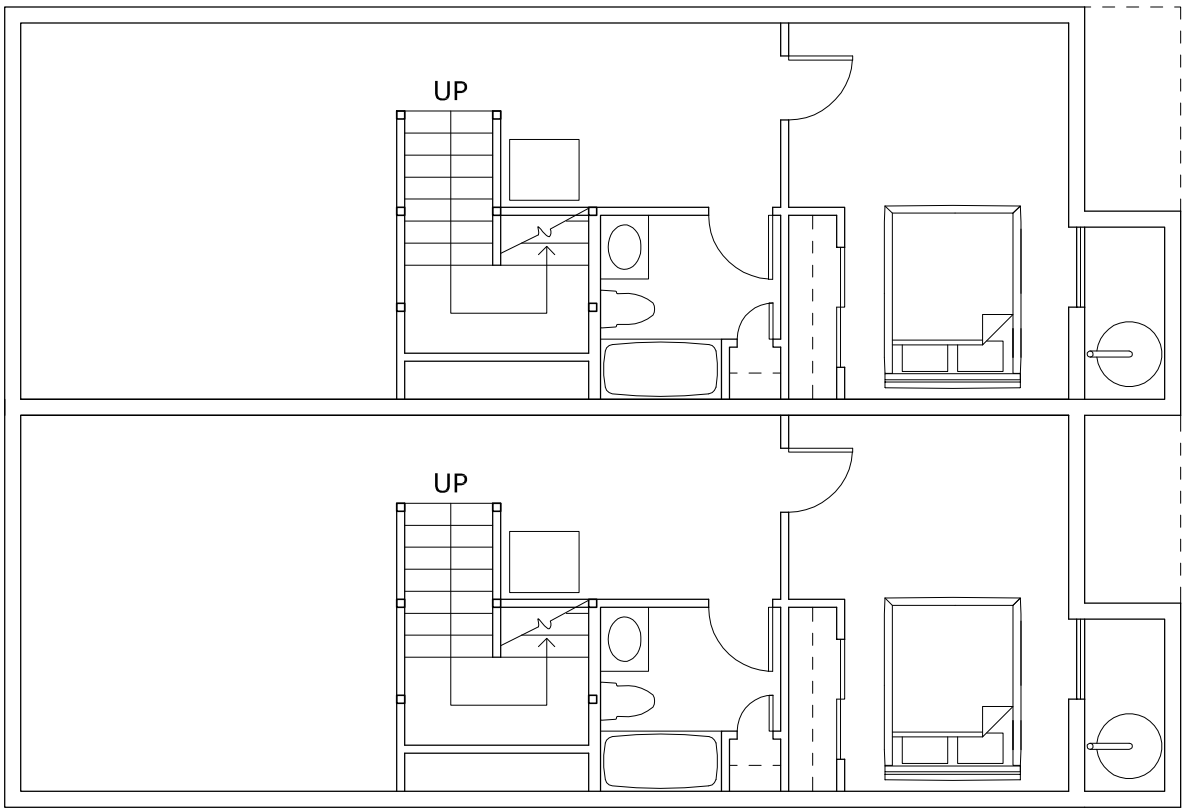
Scale: 1/8" = 1'-0"

B-ALTERNATE FLOOR PLAN LAYOUTS



4 TOWNHOME FIRST FLOOR PLAN

Scale: 1/8" = 1'-0"



3 TOWNHOMW BASEMENT FLOOR PLAN

Scale: 1/8" = 1'-0"

LEED for Homes Simplified Project Checklist

for Homes

Builder Name:	
Project Team Leader (if different):	
Home Address (Street/City/State):	*6649 Bartmer, City of University City, Missouri*

Project Description:

Building type: ***Single detached*** Project type: ***Custom***

# of bedrooms: ***3*** Floor area: ***1550***

Adjusted Certification Thresholds

Certified: ***39.5*** Gold: ***69.5***

Silver: ***54.5*** Platinum: ***84.5***

Project Point Total

Prelim: *89 + 76 maybe pts* Final: *88*

Certification Level

Prelim: *Platinum* Final: *Platinum*

Final Credit Category Total Points

ID: 2 *SS: 20* *EA: 16* *EQ: 19*

LL: 8 *WE: 10* *MR: 13* *AE: 0*

date last updated :

last updated by :

					Max Points	Project Points Preliminary Y/Pts	Maybe	No	Final Y/Pts
Innovation and Design Process (ID)			(No Minimum Points Required)		Max				
1. Integrated Project Planning		1.1	Preliminary Rating		Prereq	*Y*			*Y*
		1.2	Integrated Project Team		1	*1*	*0*		*1*
		1.3	Professional Credentialed with Respect to LEED for Homes		1	*0*	*0*		*0*
		1.4	Design Charrette		1	*1*	*0*		*1*
		1.5	Building Orientation for Solar Design		1	*0*	*1*		*0*
2. Durability Management Process		2.1	Durability Planning		Prereq	*Y*			*Y*
		2.2	Durability Management		Prereq	*Y*			*Y*
		2.3	Third-Party Durability Management Verification		3	*0*	*3*		*0*
3.Innovative or Regional Design		3.1	Innovation #1 _____		1	*0*	*1*		*0*
		3.2	Innovation #2 _____		1	*0*	*1*		*0*
		3.3	Innovation #3 _____		1	*0*	*0*		*0*
		3.4	Innovation #4		1	*0*	*0*		*0*
				Sub-Total for ID Category:	***11***	*2*	*6*		***2***
Location and Linkages (LL)			(No Minimum Points Required)	*OR*	Max				
1. LEED ND		1	LEED for Neighborhood Development	**LL2-6**	10	*0*	*10*		*0*
2. Site Selection		2	Site Selection		2	*2*	*0*		*2*
3. Preferred Locations		3.1	Edge Development	**LL 3.2**	1	*0*	*0*		*0*
		3.2	Infill		2	*2*	*0*		*2*
		3.3	Previously Developed		1	*0*	*0*		*0*
4. Infrastructure		4	Existing Infrastructure		1	*1*	*0*		*1*
5. Community Resources/ Transit		5.1	Basic Community Resources / Transit	**LL 5.2, 5.3**	1	*0*	*0*		*0*
		5.2	Extensive Community Resources / Transit	**LL 5.3**	2	*2*	*0*		*2*
		5.3	Outstanding Community Resources / Transit		3	*0*	*0*		*0*
6. Access to Open Space		6	Access to Open Space		1	*1*	*0*		*1*
				Sub-Total for LL Category:	***10***	*8*	*10*		***8***
Sustainable Sites (SS)			(Minimum of 5 SS Points Required)	*OR*	Max				
1. Site Stewardship		1.1	Erosion Controls During Construction		Prereq	*Y*			*Y*
		1.2	Minimize Disturbed Area of Site		1	*1*	*0*		*1*
2. Landscaping		2.1	No Invasive Plants		Prereq	*Y*			*Y*
		2.2	Basic Landscape Design	**SS 2.5**	2	*2*	*0*		*2*
		2.3	Limit Conventional Turf	**SS 2.5**	3	*3*	*0*		*3*
		2.4	Drought Tolerant Plants	**SS 2.5**	2	*2*	*0*		*2*
		2.5	Reduce Overall Irrigation Demand by at Least 20%		6	*0*	*0*		*0*
3. Local Heat Island Effects		3	Reduce Local Heat Island Effects		1	*1*	*0*		*1*
4. Surface Water Management		4.1	Permeable Lot		4	*4*	*0*		*4*
		4.2	Permanent Erosion Controls		1	*1*	*0*		*1*
		4.3	Management of Run-off from Roof		2	*1*	*2*		*1*
5. Nontoxic Pest Control		5	Pest Control Alternatives		2	*2*	*0*		*2*
6. Compact Development		6.1	Moderate Density	**SS 6.2, 6.3**	2	*0*	*0*		*0*
		6.2	High Density	**SS 6.3**	3	*3*	*0*		*3*
		6.3	Very High Density		4	*0*	*0*		*0*
				Sub-Total for SS Category:	***22***	*20*	*2*		***20***

LEED for Homes Simplified Project Checklist (continued)

					Max Points	Project Points Preliminary			Final
Water Efficiency (WE)			(Minimum of 3 WE Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Water Reuse		1.1	Rainwater Harvesting System	**WE 1.3**	4	*3*	*4*		***3***
		1.2	Graywater Reuse System	**WE 1.3**	1	*0*	*1*		***0***
		1.3	Use of Municipal Recycled Water System		3	*0*	*0*		***0***
2. Irrigation System	✎	2.1	High Efficiency Irrigation System	**WE 2.3**	3	*3*	*0*		***3***
		2.2	Third Party Inspection	**WE 2.3**	1	*1*	*0*		***1***
	✎	2.3	Reduce Overall Irrigation Demand by at Least 45%		4	*0*	*0*		***0***
3. Indoor Water Use		3.1	High-Efficiency Fixtures and Fittings		3	*3*	*0*		***3***
		3.2	Very High Efficiency Fixtures and Fittings		6	*0*	*6*		***0***
				Sub-Total for WE Category:	***15***	*10*	*11*		***10***
Energy and Atmosphere (EA)			(Minimum of 0 EA Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Optimize Energy Performance		1.1	Performance of ENERGY STAR for Homes		Prereq	*Y*			***Y***
		1.2	Exceptional Energy Performance		34	*0*	*34*		***0***
7. Water Heating	✎	7.1	Efficient Hot Water Distribution		2	*0*	*2*		***0***
		7.2	Pipe Insulation		1	*0*	*1*		***0***
11. Residential Refrigerant Management		11.1	Refrigerant Charge Test		Prereq	*Y*			
		11.2	Appropriate HVAC Refrigerants		1	*0*	*1*		***0***
				Sub-Total for EA Category:	***38***	*17*	*38*		***16***
Materials and Resources (MR)			(Minimum of 2 MR Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Material-Efficient Framing		1.1	Framing Order Waste Factor Limit		Prereq	*Y*			***Y***
		1.2	Detailed Framing Documents	**MR 1.5**	1	*0*	*1*		***0***
		1.3	Detailed Cut List and Lumber Order	**MR 1.5**	1	*0*	*1*		***0***
		1.4	Framing Efficiencies	**MR 1.5**	3	*0*	*3*		***0***
		1.5	Off-site Fabrication		4	*4*	*0*		***4***
2. Environmentally Preferable Products	✎	2.1	FSC Certified Tropical Wood		Prereq	*Y*			***Y***
	✎	2.2	Environmentally Preferable Products		8	*6*	*0*		***6***
3. Waste Management		3.1	Construction Waste Management Planning		Prereq	*Y*			***Y***
		3.2	Construction Waste Reduction		3	*3*	*0*		***3***
				Sub-Total for MR Category:	***16***	*13*	*5*		***13***
Indoor Environmental Quality (EQ)			(Minimum of 6 EQ Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. ENERGY STAR with IAP		1	ENERGY STAR with Indoor Air Package		13	*13*	*0*		***13***
2. Combustion Venting		2.1	Basic Combustion Venting Measures	**EQ 1**	Prereq	*Y*			***Y***
		2.2	Enhanced Combustion Venting Measures	**EQ 1**	2	*0*	*0*		***0***
3. Moisture Control		3	Moisture Load Control	**EQ 1**	1	*0*	*0*		***0***
4. Outdoor Air Ventilation	✎	4.1	Basic Outdoor Air Ventilation	**EQ 1**	Prereq	*Y*			***Y***
		4.2	Enhanced Outdoor Air Ventilation		2	*2*	*0*		***2***
		4.3	Third-Party Performance Testing	**EQ 1**	1	*0*	*0*		***0***
5. Local Exhaust	✎	5.1	Basic Local Exhaust	**EQ 1**	Prereq	*Y*			***Y***
		5.2	Enhanced Local Exhaust		1	*1*	*0*		***1***
		5.3	Third-Party Performance Testing		1	*0*	*1*		***0***
6. Distribution of Space Heating and Cooling	✎	6.1	Room-by-Room Load Calculations	**EQ 1**	Prereq	*Y*			***Y***
		6.2	Return Air Flow / Room by Room Controls	**EQ 1**	1	*0*	*0*		***0***
		6.3	Third-Party Performance Test / Multiple Zones	**EQ 1**	2	*0*	*0*		***0***
7. Air Filtering		7.1	Good Filters	**EQ 1**	Prereq	*Y*			***Y***
		7.2	Better Filters	**EQ 7.3**	1	*1*	*0*		***1***
		7.3	Best Filters		2	*0*	*0*		***0***
8. Contaminant Control	✎	8.1	Indoor Contaminant Control during Construction	**EQ 1**	1	*0*	*0*		***0***
		8.2	Indoor Contaminant Control		2	*2*	*0*		***2***
	✎	8.3	Preoccupancy Flush	**EQ 1**	1	*0*	*0*		***0***
9. Radon Protection	✎	9.1	Radon-Resistant Construction in High-Risk Areas	**EQ 1**	Prereq	*Y*			***Y***
	✎	9.2	Radon-Resistant Construction in Moderate-Risk Areas	**EQ 1**	1	*0*	*0*		***0***
10. Garage Pollutant Protection		10.1	No HVAC in Garage	**EQ 1**	Prereq	*Y*			***Y***
		10.2	Minimize Pollutants from Garage	**EQ 1, 10.4**	2	*0*	*0*		***0***
		10.3	Exhaust Fan in Garage	**EQ 1, 10.4**	1	*0*	*0*		***0***
		10.4	Detached Garage or No Garage	**EQ 1**	3	*0*	*0*		***0***
				Sub-Total for EQ Category:	***21***	*19*	*1*		***19***
Awareness and Education (AE)			(Minimum of 0 AE Points Required)		Max	Y/Pts	Maybe	No	Y/Pts
1. Education of the Homeowner or Tenant	✎	1.1	Basic Operations Training		Prereq	*Y*			***Y***
	✎	1.2	Enhanced Training		1	*0*	*1*		***0***
		1.3	Public Awareness		1	*0*	*1*		***0***
2. Education of Building Manager	✎	2	Education of Building Manager		1	*0*	*1*		***0***
				Sub-Total for AE Category:	***3***	*0*	*3*		***0***

for Homes

LEED for Homes Simplified Project Checklist

Addendum: Prescriptive Approach for Energy and Atmosphere (EA) Credits

Points cannot be earned in both the Prescriptive (below) and the Performance Approach (pg 2) of the EA section.

Energy and Atmosphere (EA) (No Minimum Points Required)			OR	Max Points	Project Points Preliminary Y/Pts	Maybe	No	Final Y/Pts
2. Insulation	2.1	Basic Insulation		Prereq	*Y*			*Y*
	2.2	Enhanced Insulation		2	*2*	*0*		*2*
3. Air Infiltration	3.1	Reduced Envelope Leakage		Prereq	*Y*			*Y*
	3.2	Greatly Reduced Envelope Leakage		2	*0*	*0*		*2*
	3.3	Minimal Envelope Leakage	**EA 3.2**	3	*3*	*0*		*0*
4. Windows	4.1	Good Windows		Prereq	*Y*			*Y*
	4.2	Enhanced Windows		2	*0*	*0*		*0*
	4.3	Exceptional Windows	**EA 4.2**	3	*3*	*0*		*3*
5. Heating and Cooling Distribution System	5.1	Reduced Distribution Losses		Prereq	*Y*			*Y*
	5.2	Greatly Reduced Distribution Losses		2	*0*	*0*		*0*
	5.3	Minimal Distribution Losses	**EA 5.2**	3	*0*	*0*		*0*
6. Space Heating and Cooling Equipment	6.1	Good HVAC Design and Installation		Prereq	*Y*			*Y*
	6.2	High-Efficiency HVAC		2	*2*	*0*		*2*
	6.3	Very High Efficiency HVAC	**EA 6.2**	4	*0*	*0*		*0*
7. Water Heating	7.1	Efficient Hot Water Distribution		2	*2*	*0*		*2*
	7.2	Pipe Insulation		1	*0*	*0*		*0*
	7.3	Efficient Domestic Hot Water Equipment		3	*0*	*0*		*0*
8. Lighting	8.1	ENERGY STAR Lights		Prereq				
	8.2	Improved Lighting		2	*0*	*0*		*0*
	8.3	Advanced Lighting Package	**EA 8.2**	3	*3*	*0*		*3*
9. Appliances	9.1	High-Efficiency Appliances		2	*2*	*0*		*2*
	9.2	Water-Efficient Clothes Washer		1	*0*	*0*		*0*
10. Renewable Energy	10	Renewable Energy System		10	*0*	*0*		*0*
11. Residential Refrigerant Management	11.1	Refrigerant Charge Test		Prereq				
	11.2	Appropriate HVAC Refrigerants		1	*0*	*0*		*0*
		Sub-Total for EA Category:		***38***	*17*	*38*		***16***

B-LEED DETAILED CHECKLIST

LEED for Homes Project Checklist

for Homes

Builder Name:	
Project Team Leader:	
Home Address (Street/City/State):	*6649 Bartmer, City of University City, Missouri*

Project Description

Building Type: ***Single detached*** Project type: ***Custom***

# of Bedrooms: ***3*** Floor Area: ***1,550***

Adjusted Certification Thresholds

Certified: ***39.5*** Gold: ***69.5***

Silver: ***54.5*** Platinum: ***84.5***

Project Point Total

Prelim: *126 + 0 maybe pts* **Final:** *98*

Certification Level

Prelim: *Platinum* **Final:** *Platinum*

Final Credit Category Point Totals

ID: 8	*SS: 20*	*EA: 16*	*EQ: 20*
LL: 8	*WE: 10*	*MR: 13*	*AE: 3*

date last updated :

last updated by :

		Max Pts. Available	Preliminary Rating Y / Pts	Maybe	No	Notes	Project Points
Innovation & Design Process (ID)	(Minimum 0 ID Points Required)	***Max: 11***	***Y:8***	***M:0***			***Final: 8***
1. Integrated Project Planning							
1.1	Preliminary Rating	*Prereq.*	*Y*				*Y*
	Target performance tier: Platinum						
1.2	Integrated Project Team *(meet all of the following)*	*1*	*1*	*0*			*1*
	☑ a) Individuals or organizations with necessary capabilities		☑ c) Regular meetings held with project team				
	☑ b) All team members involved in various project phases						
1.3	Professional Credentialed with Respect to LEED for Homes	*1*	*0*	*0*		***unavailable until further notice***	*0*
1.4	Design Charrette	*1*	*1*	*0*			*1*
1.5	Building Orientation for Solar Design *(meet all of the following)*	*1*	*1*	*0*			*1*
	☑ a) Glazing area on north/south walls 50% greater than on east/west walls		☑ c) At least 450 sq. ft. of south-facing roof area, oriented for solar applications				
	☑ b) East-west axis is within 15 degrees of due east-west		☑ d) 90% of south-facing glazing is shaded in summer, unshaded in winter				
2. Quality Management for Durability							
2.1	Durability Planning *(meet all of the following)*	*Prereq.*	*Y*				*Y*
	☑ a) Durability evaluation completed		☑ d) Durability strategies incorporated into project documentation				
	☑ b) Strategies developed to address durability issues		☑ e) Durability measures listed in durability inspection checklist				
	☑ c) Moisture control measures from Table 1 incorporated						
2.2	Durability Management *(meet one of the following)*	*Prereq.*	*Y*				*Y*
	☑ Builder has a quality management process in place		☑ Builder conducted inspection using durability inspection checklist				
2.3	Third-Party Durability Management Verification	*3*	*3*	*0*			*3*
3. Innovative or Regional Design							
3.1	Innovation 1 (ruling #):	*1*	*1*	*0*			*1*
3.2	Innovation 2 (ruling #):	*1*	*1*	*0*			*1*
3.3	Innovation 3 (ruling #):	*1*	*0*	*0*			*0*
3.4	Innovation 4 (ruling #):	*1*	*0*	*0*			*0*

LEED for Homes Project Checklist, Project Notes

This section was created to give project teams additional space to make internal notes on the progress of the project. It does not need to be used and it **should not** be submitted to USGBC. This section is unlocked, so project teams are welcome to make changes to the format as necessary. Any comments or directions provided below have not been created or endorsed by the US Green Building Council.

Date project began:	
Initiated by:	

Credits		*Responsible Party*	*Last Updated*	*Additional Notes*
ID 1. Integrated Project Planning				
	1.1			
	1.2			
	1.3			
	1.4			
	1.5			
ID 2. Quality Mgmt for Durability				
	2.1			
	2.2			
	2.3			
3. Innovative or Regional Design				
	3.1			
	3.2			
	3.3			
	3.4			

B-LEED DETAILED CHECKLIST

Location & Linkages (LL) (Minimum 0 LL Points Required)						***Max: 10***	***Y:8***	***M:0***	***Final: 8***
1. LEED for Neighborhood Development									
	1	LEED for Neighborhood Development				***10***	***0***	*0*	***0***
2. Site Selection									
	2	Site Selection *(meet all of the following)*				***2***	***2***	*0*	***2***
	☑ a) Built above 100-year floodplain defined by FEMA				☑ d) Not built on land that was public parkland prior to acquisition				
	☑ b) Not built on habitat for threatened or endangered species				☑ e) Not built on land with prime soils, unique soils, or soils of state significance				
	☑ c) Not built within 100 ft of water, including wetlands								
3. Preferred Locations									
	3.1	Edge Development				***1***	***0***	*0*	***0***
OR	3.2	Infill				***2***	***2***	*0*	***2***
AND/OR	3.3	Previously Developed				***1***	***0***	*0*	***0***
4. Infrastructure									
	4	Existing Infrastructure				***1***	***1***	*0*	***1***
5. Community Resources / Transit									
	5.1	Basic Community Resources / Transit *(meet one of the following)*				***1***	***0***	*0*	***0***
	☐ a) Within 1/4 mile of 4 basic community resources				☐ c) Within 1/2 mile of transit services providing 30 rides per weekday				
	☐ b) Within 1/2 mile of 7 basic community resources								
OR	5.2	Extensive Community Resources / Transit *(meet one of the following)*				***2***	***2***	*0*	***2***
	☐ a) Within 1/4 mile of 7 basic community resources				☐ c) Within 1/2 mile of transit services providing 60 rides per weekday				
	☑ b) Within 1/2 mile of 11 basic community resources								
OR	5.3	Outstanding Community Resources / Transit *(meet one of the following)*				***3***	***0***	*0*	***0***
	☐ a) Within 1/4 mile of 11 basic community resources				☐ c) Within 1/2 mile of transit services providing 125 rides per weekday				
	☐ b) Within 1/2 mile of 14 basic community resources								
6. Access to Open Space									
	6	Access to Open Space				***1***	***1***	*0*	***1***

B-LEED DETAILED CHECKLIST

Credits		Responsible Party	Last Updated	Additional Notes
LL 1. LEED for Neighborhood Development				
	1			
LL 2. Site Selection				
	2	Lucy Askew	11/5/2008	Building is not being developed on land with elevation below the 100-year floodplain. Nor is it being developed on land that is identified as habitat for any specied on federal endangered list. The site contains no public parkland, or "prime"/"unique" soils identified by the National Resources Conservation Service soil surveys.
LL 3. Preferred Locations				
	3.1			
	3.2	Lucy Askew	11/5/2008	At least 75% of the development site immediately borders preciously developed land.
	3.3			
LL 4. Infrastructure				
	4	Lucy Askew	11/5/2008	Selected lots of development are within 1/2 mile of existing water service lines and sewer service lines.
LL 5. Community Resources				
	5.1			
	5.2	Lucy Askew	11/5/2008	The development site is located within 1/2 mile of 11 basic community resources, such as arts/ entertainment center, bank, community or civic center, library, dry cleaner, resturant, school, supermarket, place of worship, office building, etc…
	5.3			
LL 6. Access to Open Space				
	6	Lucy Askew	11/5/2008	Development is within 1/2 mile of publicly accessible or community-based open space that is at least 3/4 acre in size.

Sustainable Sites (SS) (Minimum 5 SS Points Required)

Max: 22 Y:20 M:0 **Final: 20**

1. Site Stewardship

1.1 Erosion Controls During Construction *(meet all of the following)* — Prereq. Y — **Y**

- [x] a) Stockpile and protect disturbed topsoil from erosion.
- [x] b) Control the path and velocity of runoff with silt fencing or equivalent.
- [x] c) Protect sewer inlets, streams, and lakes with straw bales, silt fencing, etc.
- [x] d) Provide swales to divert surface water from hillsides
- [x] e) Use tiers, erosion blankets, compost blankets, etc. on sloped areas.

1.2 Minimize Disturbed Area of Site *(meet the appropriate requirements)* — 1 — 1 — 0 — **1**

Where the site is not previously developed, meet all the following:

- [ ] a) Develop tree / plant preservation plan with "no-disturbance" zones
- [ ] b) Leave 40% of buildable lot area, not including area under roof, undisturbed

OR Where the site is previously developed, meet all the following:

- [ ] c) Develop tree / plant preservation plan with "no-disturbance" zones AND
- [ ] Rehabilitate lot; undo soil compaction and remove invasive plants AND
- [ ] Meet the requirements of SS 2.2

OR [x] d) Build on a lot of 1/7 acre or less, or 7 units per acre.

2. Landscaping

2.1 No Invasive Plants — Prereq. — Y — **Y**

2.2 Basic Landscaping Design *(meet all of the following)* — 2 — 2 — 0 — **2**

- [x] a) Any turf must be drought-tolerant.
- [x] b) Do not use turf in densely shaded areas.
- [x] c) Do not use turf in areas with slope of 25%
- [x] d) Add mulch or soil amendments as appropriate.
- [x] e) All compacted soil must be filled to at least 6 inches.

AND/OR **2.3 Limit Conventional Turf** — 3 — 3 — 0 — **3**

20% Percentage of designed landscape softscape area that is turf

AND/OR **2.4 Drought-Tolerant Plants** — 2 — 2 — 0 — **2**

90% Percentage of installed plants that are drought-tolerant

OR **2.5 Reduce Overall Irrigation Demand by at Least 20%** — 6 — 0 — 0 — **0**

0% Percentage reduction in estimated irrigation water demand

3. Reduce Local Heat Island Effects

3 Reduce Local Heat Island Effects *(meet one of the following)* — 1 — 1 — 0 — **1**

- [ ] a) Locate trees / plantings to provide shade for 50% of hardscapes
- [x] b) Install light-colored, high-albedo materials for 50% of hardscapes

4. Surface Water Management

4.1 Permeable Lot — 4 — 4 — 0 — **4**

75% vegetative landscape

20% permeable paving

5% impermeable surfaces directed to infiltration features

0% other impermeable surfaces

4.2 Permanent Erosion Controls *(meet one of the following)* — 1 — 1 — 0 — **1**

- [ ] a) For portions of lot on steep slope, use terracing and retaining walls
- [x] b) Plant trees, shrubs, or groundcover

4.3 Management of Runoff from Roof *(meet any, see Rating System for pts)* — 2 — 1 — 0 — **1**

- [x] a) Install permanent stormwater controls to manage runoff from the home
- [ ] b) Install vegetated roof to cover 50% of roof area
- [ ] c) Install vegetated roof to cover 100% of roof area
- [ ] d) Have lot designed by professional to manage runoff from home on-site

5. Nontoxic Pest Control

5 Pest Control Alternatives *(meet any of the following, 1/2 pt each)* — 2 — 2 — 0 — **2**

- [x] a) Keep all wood at least 12" above soil
- [x] b) Seal external cracks, joints, etc. with caulking and install pest-proof screens
- [ ] c) Include no wood-to-concrete connections, or separate connections with dividers
- [x] d) Install landscaping so mature plants are 24" from home

e) In 'moderate' to 'very heavy' termite risk areas:

- [ ] i) Treat all cellulosic material with borate product to 3' above foundation
- [ ] ii) Install sand or diatomaceous earth barrier
- [x] iii) Install steel mesh barrier termite control system
- [ ] iv) Install non-toxic termite bait system
- [ ] v) Use noncellulosic wall structure
- [ ] vi) Use solid concrete foundation walls or pest-proof masonry wall design

6. Compact Development

6.1 Moderate Density — 2 — 0 — 0 — **0**

OR **6.2 High Density** — 3 — 3 — 0 — **3**

OR **6.3 Very High Density** — 4 — 0 — 0 — **0**

B-LEED DETAILED CHECKLIST

Credits		*Responsible Party*	*Last Updated*	*Additional Notes*
SS 1. Site Stewardship				
	1.1	Laura Anderson	11/5/2008	Erosin Controls during construction will be meet by: Topsoil preservation, runoff control, protection of on-site storm sewer inlets, rainwater management, and soil stabilization as needed.
	1.2	Laura Anderson	11/5/2008	Site lot area is less than 1/7 acre. Lot size = 30 ft. X 146 ft. = 4,380 SF which is less than 6,223 SF or 1/7 acre.
SS 2. Landscaping				
	2.1	Laura Anderson	11/5/2008	No invasive plants. Source: Missouri Botanical Gardens, Kemper Center for Home Gardening
	2.2	Laura Anderson	11/5/2008	Fully landscaped. Utilizing naturscaping; Prairie Garden (see appendix for plant list and landscape plan.) Plants are drought-tolerant, will not place turf in densely shaded areas or on slopes of 25%. Mulch will be utilized to prevent erosin and water loss and to help regulate soil temperature. Soil compaction due to construction vehicles must be tilled to at least 6 inches.
	2.3	Laura Anderson	11/5/2008	There will be less than 20% of conventional turf in the designed landscape softscapes.
	2.4	Laura Anderson	11/5/2008	90% or more drought-tolerant plants.
	2.5			
SS 3. Reduce Local Heat Island Effects				
	3	Laura Anderson	11/5/2008	Open pavers will be installed for 100% of sidewalks, patios, and driveways within 50 feet of the home.
SS 4. Surface Water Management				
	4.1	Laura Anderson	11/5/2008	100% of buildable lot, not including area under roof, is permeable, or designed to capture water runoff for infiltration on-site. Vegetative landscape = 1476 SF =75%, Permeable paving = 730 SF = 20%, Impermeable surfaces designed to direct all runoff toward an appropriate permaent infiltration feature = 169 SF = 5%.
	4.2	Laura Anderson	11/5/2008	Native groundcover is 2,716 SF or 75% of lot. The lot is 4,380 SF total. 50 SF of native groundcover per 500 square feet of disturbed lot area = 4,380/ 500=9, 9*50=450 SF< 2,716 SF.
	4.3	Laura Anderson	11/5/2008	Permanent stormwater controls include vegetated swales, on-site rain garden, and rainwater cistern to manage runoff from the home.
SS 5. Nontoxic Pest Control				
	5	Laura Anderson	11/5/2008	All wood to be keep at least 12" above soil. Seal all external cracks, joints, penetrations, edges, and entry points with caulking. Where openings cannot be caulked or sealed, install rodent and corrosion-proof screens. All mature plants to be keep 24" from the home. Termite area is moderate to heavy in U-City per 2000 International Residential Building Code, therefore, install a steel mesh barrier termite control system.
SS 6. Compact Development				
	6.1			
	6.2	Laura Anderson	11/5/2008	The lot is 1/10 acre buildable lot, therefore the development is classified High Density.
	6.3			

Water Efficiency (WE) (Minimum 3 WE Points Required) — Max: 15 Y:15 M:0 — Final: 10

1. Water Reuse

	1.1	Rainwater Harvesting System	4	4	0	3

50% Percentage of roof area used for harvesting

Outdoor only Application

AND/OR	1.2	Graywater Reuse System	1	1	0	0
OR	1.3	Use of Municipal Recycled Water System	3	0	0	0

2. Irrigation System

	2.1	High-Efficiency Irrigation System *(meet any of the following, 1 pt each)*	3	3	0	3

- ☐ a) Irrigation system designed by EPA Water Sense certified professional
- ☐ b) Irrigation system with head-to-head coverage
- ☐ c) Install central shut-off valve
- ☐ d) Install submeter for the irrigation system
- ☑ e) Use drip irrigation for 50% of planting beds
- ☐ f) Create separate zones for each type of bedding
- ☑ g) Install timer or controller for each watering zone
- ☑ h) Install pressure-regulating devices
- ☐ i) High-efficiency nozzles with distribution uniformity of at least 0.70.
- ☐ j) Check valves in heads
- ☐ k) Install moisture sensor or rain delay controller

AND/OR	2.2	Third-party Inspection	1	1	0	1
	2.3	Reduce Overall Irrigation Demand by at Least 45%	4	0	0	0

☐ Full points earned in SS 2.3

0% Percentage reduction in estimated irrigation water demand

3. Indoor Water Use

	3.1	High-Efficiency Fixtures and Fittings *(meet any of the following, 1 pt each)*	3	0	0	3

- ☐ a) Average flow rate of lavatory faucets is ≤ 2 gpm
- ☐ b) Average flow rate for all showers is ≤ 2.0 gpm per stall
- ☐ c) Average flow rate for all toilets is ≤ 1.3 gpf; OR
  - ☐ Toilets are dual-flush; OR
  - ☐ Toilets meet the EPA Water Sense specification

	3.2	Very High-Efficiency Fixtures and Fittings *(meet any, 2 pts each)*	6	6	0	0

- ☐ a) Average flow rate of lavatory faucets is ≤ 1.5 gpm; OR
  - ☐ Lavatory faucets meet the EPA Water Sense specification
- ☐ b) Average flow rate for all showers ≤ 1.75 gpm per stall
- ☐ c) Average flow rate for all toilets is ≤ 1.1 gpf

B-LEED DETAILED CHECKLIST

Credits		*Responsible Party*	*Last Updated*	*Additional Notes*
WE 1. Water Reuse				
	1.1	Clayton Holmes	11/6/2008	Outdoor water retention and reuse of atleast 50% of stormwater can be achieved at a minimal cost. Max storm event calculation indicates that 189 gallon cistern would hold 50% of the water for irrigation purposes.
	1.2	Clayton Holmes	11/6/2008	Use of greywater reuse may be cost prohibitive.
	1.3			
WE 2. Irrigation System				
	2.1	Clayton Holmes	11/6/2008	Design the irrigation system such that: 1) Used Drip Irrigation for greater than 50% of the planting beds, 2) Installed a timer for each watering zone that activated at the optimal time of day 3) Installed pressure-regulating devices which prevented misting of water,
	2.2	Clayton Holmes	11/6/2008	Credit for performing an independent third-party inspection, if cost effective & fufilled all the reqs.
	2.3			
WE 3. Indoor Water Use				
	3.1	Clayton Holmes	11/6/2008	It is highly likely that the efficiency of the plumbing fixtures would be high, as opposed to very-high for cost-effective purposes.
	3.2			

Energy & Atmosphere (EA) (Minimum 0 EA Points Required)	***Max: 38***	***Y:38***	***M:0***	***Final: 16***
1. Optimize Energy Performance				
1.1 Performance of ENERGY STAR for Homes	*Prereq.*	*Y*		*Y*
1.2 Exceptional Energy Performance	*34*	*34*	*0*	*0*
4 IECC climate zone *70* HERS Index				
7. Water Heating				
7.1 Efficient Hot Water Distribution System *(meet one of the following)*	*2*	*2*	*0*	*0*
☐ a) Structured plumbing system		☑ c) Compact design of conventional system		
☐ b) Central manifold distribution system				
7.2 Pipe Insulation	*1*	*1*	*0*	*0*
11. Residential Refrigerant Management				
11.1 Refrigerant Charge Test	*Prereq.*	*Y*		
11.2 Appropriate HVAC Refrigerants *(meet one of the following)*	*1*	*1*	*0*	*0*
☐ a) Use no refrigerants		☐ c) Use refrigerants that complies with global warming potential equation		
☐ b) Use non-HCFC refrigerants				

B-LEED DETAILED CHECKLIST

Credits		*Responsible Party*	*Last Updated*	*Additional Notes*
EA 1. Optimize Energy Performance				
	1.1			
	1.2	Kirsten Pearson	11/5/2008	To receive the mazimum number of points (34) for this category, the designed home would have to exceed the Energy Star standards by 100%. This home would have to be designed as a zero-energy building (ZEB.) Recommendation to use Prescriptive Approach.
EA 7. Water Heating				
	7.1			
	7.2			
EA 11. Residential Refrigerant Management				
	11.1			
	11.2			

Materials & Resources (MR) (Minimum 2 MR Points Required) — Max: 16 Y:14 M:0 — Final: 13

1. Material-Efficient Framing

1.1	Framing Order Waste Factor	Prereq.	Y		Y
1.2	Detailed Framing Documents	1	1	0	0
1.3	Detailed Cut List and Lumber Order	1	1	0	0

☐ Requirements of MR 1.2 have been met

☐ Detailed cut list and lumber order corresponding to framing plans or scopes

AND/OR 1.4	Framing Efficiencies *(meet any of the following, see Rating System for pts)*	3	3	0	0

☐ Precut framing packages
☐ Open-web floor trusses
☐ Structural insulated panel walls
☐ Structural insulated panel roof
☐ Structural insulated panel floors

☐ Stud spacing greater than 16" on center
☐ Ceiling joist spacing greater than 16" on center
☐ Floor joist spacing greater than 16" on center
☐ Roof rafter spacing greater than 16" on center
☐ Two of the following: Size headers for loads; ladder blocking; drywall clips; 2-stud corners

OR 1.5	Off-site Fabrication *(meet one of the following)*	4	4	0	4

☐ a) Panelized construction

☑ b) Modular, prefabricated construction

2. Environmentally Preferable Products

2.1	FSC Certified Tropical Wood *(meet both of the following)*	Prereq.	Y		Y

☐ a) Provide wood suppliers with a notice of preference for FSC-certified products

☑ b) Only use tropical wood that is FSC-certified

2.2	Environmentally Preferable Products *(meet any, 1/2 pt each)*	8	6	0	6

Assembly : component	(a) EPP			(b) Low emission		(c) Local production	
Exterior wall: framing	☑		type: FSC			☑	
Exterior wall: siding or masonry	☐		type:			☑	
Floor: flooring	☐	(45%)	type:	☐	90% hard flooring	☐	(45%)
Floor: flooring	☑	(90%)	type: Bamboo	☐	SCS FloorScore	☐	(90%)
Floor: carpet			type:	☐	Green Label Plus	☐	
Floor: framing	☑		type: FSC	☐		☐	
Foundation: aggregate						☑	
Foundation: cement	☐					☐	
Interior wall: framing	☑		type: FSC			☑	
Interior wall, ceiling: gypsum board						☐	
Interior wall, ceiling, millwork: paint	☐			☑			
Landscape: decking or patio	☑		type: FSC			☑	
Other: cabinet	☐		type:			☐	
Other: counter	☐		type:			☐	
Other: door	☐		type:			☐	
Other : trim	☐		type:			☐	
Other : adhesive, sealant				☐			
Other : window frame	☐		type:			☐	
Roof: framing	☐					☐	
Roof: roofing	☑					☐	
Roof, floor, wall: insulation	☐			☐		☐	
Roof, floor, wall (2 of 3): sheathing	☐		type:			☐	

3. Waste Management

3.1	Construction Waste Management Planning *(meet both of the following)*	Prereq.	Y		Y

☑ a) Investigate local options for waste diversion

☑ b) Document diversion rate for construction waste

3.2	Construction Waste Reduction *(use one of the following methods)*	3	3	0	3

2.5 a) pounds waste / square foot

cubic yards waste / 1,000 square feet

100% b) percentage of waste diverted

B-LEED DETAILED CHECKLIST

Credits		*Responsible Party*	*Last Updated*	*Additional Notes*
MR 1. Material-Efficient Framing				
	1.1	Lucy Askew	11/5/2008	The overall waste factor is less than 10% due to modular, prefabricated construction.
	1.2			
	1.3			
	1.4			
	1.5	Lucy Askew	11/5/2008	Modular, prefabricated construction is being used as an alternative to on-site framing and enclosure construction. All principle building sections will be delivered to the job site as prefabricated modules.
MR 2. Environmentally Preferable Products				
	2.1	Lucy Askew	11/5/2008	All wood used in construction of prefabricated, modular homes is FSC certified tropical wood.
	2.2	Lucy Askew	11/5/2008	Building component materials made up of 90% of components by weight or volume. A single point that meets each criterion (environmentally preferable, low emissions, and local sourcing) can earn points for each. The products chosen are either environmentally preferable or locally produced, meaning the products were extracted, processed, and manufactured within 500 miles. Some of these products include: concrete foundation walls with use of 30% fly ash, FSC wood frame walls, bamboo flooring, aggregate cement, low-VOC paint, recycled roofing, etc...
MR 3. Waste Management				
	3.1	Lucy Askew	11/5/2008	Project waste will be diverted to local recycling facilites. This includes cardboard packaging, household recyclable, etc…
	3.2	Lucy Askew	11/5/2008	Constuction waste is reduced to 2.5 pounds or less of net waste per square foot of conditioned floor area.

Indoor Environmental Quality (EQ) (Minimum 6 EQ Points Required) — Max: 21 Y:20 M:0 — Final: 20

1. ENERGY STAR with Indoor Air Package

1	ENERGY STAR with Indoor Air Package	13	13	0	13

2. Combustion Venting

2.1	Basic Combustion Venting Measures *(meet all of the following)*	Prereq.	Y		Y

- ☐ a) no unvented combustion appliances
- ☐ b) carbon monoxide monitors on each floor
- ☐ c) all fireplaces and woodstoves have doors
- ☐ d) space, water heating equipment designed with closed combustion; OR
- ☐ space and water heating equipment has power-vented exhaust; OR
- ☐ space and water heating equipment located in detached or open-air facility; OR
- ☐ no space- or water-heating equipment with combustion

2.2	Enhanced Combustion Venting Measures *(meet one of the following)*	2	0	0	0

Type of Fireplace or stove	*Better practice (1 pt)*	*Best practice (2 pts) (must also meet Better Practice)*
None		☐ granted automatically
Masonry wood-burning fireplace	☐ masonry heater	☐ back-draft potential test
Factory-built wood-burning fireplace	☐ listed by testing lab and meets EPA standards	☐ back-draft potential test
Woodstove and fireplace insert	☐ listed by testing lab and meets EPA standards	☐ back-draft potential test
Natural gas, propane, or alcohol stove	☐ listed, power- or direct-vented, fixed doors	☐ electronic pilot
Pelle stove	☐ EPA certified or meets safety requirements	☐ power- or direct-venting

3. Moisture Control

3	Moisture Load Control *(meet one of the following)*	1	0	0	0

- ☐ a) Additional dehumidification system
- ☐ b) Central HVAC system equipped with additional dehumidification mode

4. Outdoor Air Ventilation

4.1	Basic Outdoor Air Ventilation *(meet one of the following)*	Prereq.	Y		Y

- ☐ a) Located in a climate with ≤ 4,500 infiltration degree days
- ☐ b) Continuous ventilation
- ☐ c) Intermittent ventilation
- ☑ d) Passive ventilation

4.2	Enhanced Outdoor Air Ventilation *(meet one of the following)*	2	2	0	2

- ☐ a) In climates with ≤ 4,500 infiltration degree days, install active ventilation system
- ☑ b) Install heat recovery system

4.3	Third-Party Performance Testing	1	0	0	0

5. Local Exhaust

5.1	Basic Local Exhaust *(meet all of the following)*	Prereq.	Y		Y

- ☐ a) Bathroom and kitchen exhaust meets ASHRAE Std. 62.2 air flow requirement
- ☐ b) Fans and ducts designed and installed to ASHRAE Std. 62.2
- ☐ c) Air exhausted to outdoors
- ☐ d) ENERGY STAR labeled bathroom exhaust fans

5.2	Enhanced Local Exhaust *(meet one of the following)*	1	1	0	1

- ☐ a) Occupancy sensor
- ☐ b) Automatic humidistat controller
- ☑ c) Automatic timer tied to switch
- ☐ d) Continuously operating exhaust fan

5.3	Third-Party Performance Testing	1	1	0	1

6. Distribution of Space Heating and Cooling

6.1	Room-by-Room Load Calculations	Prereq.	Y		Y
6.2	Return Air Flow / Room-by-Room Controls *(meet one of the following)*	1	0	0	0

A. Forced-Air Systems
- ☐ a) Return air opening of 1 sq. inch per cfm of supply
- ☐ b) Limited pressure differential between closed room and adjacent spaces

B. Nonducted HVAC Systems
- ☐ Flow control valves on every radiator

6.3	Third-Party Performance Test / Multiple Zones *(meet one of the following)*	2	0	0	0

A. Forced-Air Systems
- ☐ Have supply air flow rates in each room tested and confirmed

B. Nonducted HVAC Systems
- ☐ Install at least two distinct zones with independent thermostat control

7. Air Filtering

	7.1	Good Filters	Prereq.	Y		Y
	7.2	Better Filters	1	1	0	1
OR	7.3	Best Filters	2	0	0	0

8. Contaminant Control

8.1	Indoor Contaminant Control during Construction	1	0	0	0
8.2	Indoor Contaminant Control *(meet any of the following, 1 pt each)*	2	2	0	2

- ☑ a) Design and install permanent walk-off mats at each entry
- ☑ b) Design shoe removal and storage space near primary entryway
- ☐ c) Install central vacuum system with exhaust to ourdoors

8.3	Preoccupancy Flush	1	0	0	0

9. Radon Protection

9.1	Radon-Resistant Construction in High-Risk Areas	Prereq.	Y		Y
9.2	Radon-Resistant Construction in Moderate-Risk Areas	1	0	0	0

10. Garage Pollutant Protection

10.1	No HVAC in Garage	Prereq.	Y		Y
10.2	Minimize Pollutants from Garage *(meet all of the following)*	2	0	0	0

a) In conditioned spaces above garage:
- ☐ Seal all penetrations and connecting floor and ceiling joist bays
- ☐ Paint walls and ceilings of shared walls, including garage

b) In conditioned spaces next to garage
- ☐ Weather-strip all doors
- ☐ carbon monoxide detectors in rooms that share a door with garage
- ☐ Seal all penetrations and cracks at the base of walls

AND/OR	10.3	Exhaust Fan in Garage *(meet one of the following)*	1	0	0	0

- ☐ a) Fan runs continuously
- ☐ b) Fan designed with automatic timer control

OR	10.4	Detached Garage or No Garage	3	0	0	0

B-LEED DETAILED CHECKLIST

Credits		Responsible Party	Last Updated	Additional Notes
EQ 1. ENERGY STAR w/ IAP				
	1			
EQ 2. Combustion Venting				
	2.1			
	2.2			
EQ 3. Moisture Control				
	3			
EQ 4. Outdoor Air Ventilation				
	4.1			
	4.2			
	4.3			
EQ 5. Local Exhaust				
	5.1			
	5.2			
	5.3			
EQ 6. Distribution of Space Heating and Cooling				
	6.1			
	6.2			
	6.3			
EQ 7. Air Filtering				
	7.1			
	7.2			
	7.3			
EQ 8. Contaminant Control				
	8.1			
	8.2			
	8.3			
EQ 9. Radon Protection				
	9.1			
	9.2			
EQ 10. Garage Pollutant Protection				
	10.1			
	10.2			
	10.3			
	10.4			

Awareness & Education (AE) (Minimum 0 AE Points Required)	***Max: 3***	***Y:3***	***M:0***	***Final: 3***
1. Education of the Homeowner or Tenant				
1.1 Basic Operations Training *(meet both of the following)*	***Prereq.***	***Y***		***Y***
☐ a) Operations and training manual	☐ b) One-hour walkthrough with occupant(s)			
1.2 Enhanced Training	***1***	***1***	***0***	***1***
1.3 Public Awareness *(meet three of the following)*	***1***	***1***	***0***	***1***
☑ a) Open house on at least four weekends	☑ c) Newspaper article on the project			
☑ b) Website about features and benefits of LEED homes	☐ d) Display LEED signage on the exterior of the home			
2. Education of the Building Manager				
2 Education of the Building Manager *(meet both of the following)*	***1***	***1***	***0***	***1***
☑ a) Operations and training manual	☑ b) One-hour walkthrough with building manager			

By affixing my signature below, the undersigned does hereby declare and affirm to the USGBC that the LEED for Homes requirements, as specified in the LEED for Homes Rating System, have been met for the indicated credits and will, if audited, provide the necessary supporting documents.

Project Team Leader		Company	
Signature		Date	

By affixing my signature below, the undersigned does hereby declare and affirm to the USGBC that the required inspections and performance testing for the LEED for Homes requirements, as specified in the LEED for Homes Rating System, have been completed, and will provide the project documentation file, if requested.

Green Rater		Company	
Signature		Date	

By affixing my signature below, the undersigned does hereby declare and affirm to the USGBC that the required inspections and performance testing for the LEED for Homes requirements, as specified in the LEED for Homes Rating System, have been completed, and will provide the project documentation file, if requested.

Provider's Certifier		Company	
Signature		Date	

B-LEED DETAILED CHECKLIST

Credits		*Responsible Party*	*Last Updated*	*Additional Notes*
AE 1. Education of Home Owner / Tenant				
	1.1			
	1.2			
	1.3			
AE 2. Education of the Building Manager				
	2			

LEED for Homes Project Checklist

Addendum: Prescriptive Approach for Energy and Atmosphere (EA) Credits

for Homes

Points cannot be earned in both the Prescriptive (below) and the Performance paths of the EA section.

		Max Pts. Available	Preliminary Rating Y / Pts	Maybe	No	Notes	Project Points
Energy & Atmosphere (EA)	(Minimum 0 EA Points Required)	**Max: 38**	**Y:38**	**M:0**			**Final: 16**
2. Insulation							
2.1	Basic Insulation *(meet both of the following)*	Prereq.	Y				Y
	☑ a) Insulation meets R-value requirements of IECC		☑ b) Insulation meets HERS Grade II specifications for installation				
2.2	Enhanced Insulation *(meet both of the following)*	2	2	0			2
	☑ a) Insulation exceeds R-value requirements of IECC by 5%		☐ b) Insulation meets HERS Grade I specifications for installation				
3. Air Infiltration							
3.1	Reduced Envelope Leakage	Prereq.	Y				Y
	4.0 Air leakage rate in ACH50						
3.2	Greatly Reduced Envelope Leakage	2	0	0			2
OR 3.3	Minimal Envelope Leakage	3	3	0			0
4. Windows							
4.1	Good Windows *(meet all of the following)*	Prereq.	Y				Y
	☑ a) Windows and glass doors meet ENERGY STAR BOP window specifications		☑ b) Skylight glazing area is ≤ 3% of floor area AND ☑ Skylights meet ENERGY STAR requirements for skylights				
4.2	Enhanced Windows	2	0	0			0
OR 4.3	Exceptional Windows	3	3	0			3
5. Heating and Cooling Distribution System							
5.1	Reduced Distribution Losses *(meet all of the following, as appropriate)*	Prereq.	Y				Y
	A. Forced-Air Systems		B. Nonducted HVAC Systems				
	☑ a) Duct leakage of ≤ 4.0 CFM at 25 Pascals per 100 sq.ft.		☐ At least R-3 insulation around pipes in unconditioned spaces				
	☑ b) No ducts in exterior walls unless extra insulation is added						
	☑ c) At least R-6 insulation around ducts in unconditioned spaces						
5.2	Greatly Reduced Distribution Losses *(meet the following, as appropriate)*	2	0	0			0
	A. Forced-Air Systems		B. Nonducted HVAC Systems				
	☐ Duct leakage of ≤ 3.0 CFM at 25 Pascals per 100 sq.ft.		☐ Keep the boiler and pipes entirely within conditioned envelope				
OR 5.3	Minimal Distribution Losses *(meet one of the following, as appropriate)*	3	0	0			0
	A. Forced-Air Systems		B. Nonducted HVAC Systems				
	☐ a) Duct leakage of ≤ 1.0 CFM at 25 Pascals per 100 sq.ft.		☐ Outdoor reset control to set distribution temp. based on outdoor temp.				
	☐ b) Air-handler and all ductwork is within conditioned envelope and EA 3.3 is met						
	☐ c) Air-handler and all ductwork visibly within conditioned spaces (not in walls, etc.)						
6. Space Heating and Cooling Equipment							
6.1	Good HVAC Design and Installation *(meet all of the following)*	Prereq.	Y				Y
	☑ a) Design and size HVAC equipment using ACCA Manual J or equivalent		☑ c) Install ENERGY STAR programmable thermostat OR				
	☑ b) Install efficient heating and cooling equipment (see Table)		☐ Heat pump or hydronic installed and exempted from part (c)				
	undetermined Type of HVAC						
	Cooling efficiency (SEER / EER)		Heating Efficiency (AFUE / HSPF / COP)				
6.2	High-Efficiency HVAC	2	2	0			2
OR 6.3	Very High Efficiency HVAC	3	0	0			0
7. Water Heating							
7.1	Efficient Hot Water Distribution System *(meet one of the following)*	2	2	0			2
	☐ a) Structured plumbing system		☑ c) Compact design of conventional system				
	☐ b) Central manifold distribution system						
7.2	Pipe Insulation	1	0	0			0
7.3	Efficient Domestic Hot Water Equipment	3	0	0			0
	Type of DHW system						
	Efficiency		Solar: Percentage of annual DHW load				
8. Lighting							
8.1	ENERGY STAR Lights	Prereq.					
8.2	Improved Lighting *(meet one of the following, see Rating System for pts)*	1.5	0	0			0
	☐ a) Indoor lighting - 3 additional ENERGY STAR lights in high-use rooms		☐ b) Exterior lighting - motion sensor controls or integrated PV				
OR 8.3	Advanced Lighting Package *(meet one of the following)*	3	3	0			3
	☑ a) 60% of fixtures are ENERGY STAR fixtures		☐ b) 80% of lamps are ENERGY STAR CFLs				
9. Appliances							
9.1	High-Efficiency Appliances *(meet any, see Rating System for pts)*	2	2	0			2
	☑ a) ENERGY STAR labeled refrigerator		☑ c) ENERGY STAR labeled dishwasher using 6.0 gallons per cycle or less				
	☑ b) ENERGY STAR labeled ceiling fans in living/family room and all bedrooms		☑ d) ENERGY STAR clothes washer				
9.2	☐ Water-Efficiency Clothes Washer	1	0	0			0
10. Renewable Energy							
10	Renewable Energy System	10	0	0			0.0
	0 Reference electric load, kWh/yr (based on HERS model)		0 Electricity supplied by renewable system, kWh/yr				
	0.0% Percentage of annual reference electric load met by renewable system						
11. Residential Refrigerant Management							
11.1	Refrigerant Charge Test	Prereq.					
11.2	Appropriate HVAC Refrigerants *(meet one of the following)*	1	0	0			0

B-LEED DETAILED CHECKLIST

Credits		Responsible Party	Last Updated	Additional Notes
EA 2. Insulation				
	2.1	Kirsten Pearson	11/5/2008	Icynene spray foam insulation significantly lowers air leakage of the building envelope. Home must be inspected by Energy Star Rater.
	2.2	Kirsten Pearson	11/5/2008	Proposing the use of Icynene foam insulation. Typ. R-values range from 3.5 to 6.0 per inch. Reduction of up to 50% in energy consumption.
EA 3. Air Infiltration				
	3.1	Kirsten Pearson	11/5/2008	Requires Energy Rater to test and verify air leakage rate to be < 7
	3.2	Kirsten Pearson	11/5/2008	very likely, if air leakage rate is < 5
OR	3.3	Kirsten Pearson	11/5/2008	possible if air leakage rate is < 3
EA 4. Windows				
	4.1	Kirsten Pearson	11/5/2008	Installing exceptional windows in each of the U-City homes is of utmost importance.
	4.2			
OR	4.3	Kirsten Pearson	11/5/2008	Windows must have atleast a U-factor of <=0.32 and an Solar heat gain factor(SHGF) <=0.40
EA 5. Heating and Cooling Distribution				
	5.1			
	5.2			
OR	5.3			
EA 6. Space Heating and Cooling Equipment				
	6.1	Kirsten Pearson	11/5/2008	Requires Energy Rater to test and verify
	6.2			
OR	6.3			
EA 7. Water Heating				
	7.1	Kirsten Pearson	11/5/2008	Compact Design of Convetional System
	7.2			
	7.3			
EA 8. Lighting				
	8.1			
	8.2			
OR	8.3			
EA 9. Appliances				
	9.1			
	9.2			
EA 10. Renewable Energy				
	10			
EA 11. Residential Refrigerant Management				
	11.1			
	11.2			

APPENDIX B - LEED WATER EFFICIENCY CREDITS

LEED for Homes - Jan 2008
Water Efficiency Category

Point Feasibility Assessment

WE 1:
Greater than 50% Rainwater harvested from roof.
Max Points: 5

Synopsis: HIGHLY LIKELY (3 points)
POSSIBLE (5 points) if not cost-prohibitive

Description:

This Credit involves both Rainwater Harvesting and Greywater Reuse, in the application of landscape irrigation and possible indoor reuse. The Greywater Reuse component, while earning extra points, involves attaining a higher percentage Rainwater collected (from 50% to 75%) and installing a secondary plumbing system to divert, treat, and recycle the the greywater back into the plumbing components served by it. The additional cost incurred by such a system is directly proportional to the linear feet of piping required for its installation and the extensiveness of its treatment. For example, the Greywater system could treat the water leaving either lavatory, shower, or clothes washing machines, or any combination of the three. The installation of such a system, though fundamental to the ethos of sustainable living, may be outside the budget limits of this project.

However, financial assistance for Water Treatment incentives, including Grants of up to $5000, may be available on the State and federal levels through the Department of Natural Resources, on a case-by-case basis, through their application process. Information on application and eligibility may be found on their website, at: http:\\www.dnr.mo.gov.

Setting unknown variables aside, the greater majority of points for the credit may still be earned through Rainwater Harvesting alone, in outdoor application only. WE 1.1 states that capturing greater than 50% of all rainwater from the roofplane for irrigation purposes earns 3 points. The roofplane measures 800 sq. ft., and average monthly rainfall for the St. Louis area ranges from 4 inches to 2.5 inches, most recently spiking in March 2008 to 8.4 inches in one month (a record rainfall). Calculations made using the Rooftop Water Yield Equation (re: Appendix) demonstrate that an average rainfall would generate 146 gallons on our roof in a month, while a record storm period could create 378 gallons in the same time. WE 1.1 requires our Rainwater Collection System to divert over 50% of this rainfall, amounting to at least 189 gallons collected and stored over one month for irrigation purposes.

Providing for such storage space can be achieved at minimal cost. While a 200-

gallon cistern would cost around $250, excluding installation, a series of smaller Rain Barrels may be all that is necessary for a project of this size. Four 55-gallon rain barrels, at $25 apiece, would require $100 in the budget and take up minimal space in the yard. However, in the case of implementing a combination of Rainwater Harvesting and Greywater Recycling, the use of a cistern is more sensible, efficient, and attractive (as it may be buried if necessary). It is a matter of balancing budget considerations with increased efficiency and maximized sustainable living, and as is often the case, these trade-offs beg consideration.

WE 2:
High-Efficiency Irrigation System
Max Points: 4

Synopsis: HIGHLY LIKELY (3 points)
LIKELY (4 points) if not cost-prohibitive

Description:

This Credit requires the implementation of various measures to ensure the control and efficiency of the outdoor Irrigation System. From a list of eleven possible measures, incorporating three will earn the maximum points possible (3) for LEED WE 2.1.

For example, if the System:
1) Used Drip Irrigation for greater than 50% of the planting beds,
2) Installed a timer for each watering zone that activated at the optimal time of day
3) Installed pressure-regulating devices which prevented misting of water,

the optimal points would be acheived for LEED WE 2.

In addition to these three measures, and all other applicable measures from the list (re: LEED WE 2.1) one extra point may be earned for performing an independent third-party inspection of the system, according to the requirements described in LEED WE 2.2. If the cost of this process were to stay within the limits of the established budget, and were the system to satisfy all the requirements, one extra point would be earned upon the completion of the inspection.

WE 3:

Indoor Water Use - Efficiency of Plumbing Fixtures and Fittings
Max Points: 6

Synopsis: HIGHLY LIKELY (3 Points)
POSSIBLE (6 Points) if not cost-prohibitive

APPENDIX B - LEED WATER EFFICIENCY CREDITS

Description:

This credit involves the installation and use of highly efficient plumbing fixtures, including shower heads, sink and tub faucets, and toilet flushing systems. While High Efficiency fixtures, (i.e. those fixtures meeting the specifications described in LEED WE 3.1) are included at a minimum in the proposed design, Very High Efficiency fixtures would also be considered, if potential increases in cost did not put them outside the allotted budget for these types of fixtures. However, the amount saved on reduced water usage costs would eventually (after a certain time has passed) equal the costs incurred by the purchase of these Very High Efficiency Fixtures, and this consideration must be balanced over the life cost considerations of building operation and maintenance, as well as potential building longevity.

APPENDIX B - LEED WATER EFFICIENCY CREDITS

Saint Louis, MO (63116) Weather Facts

- The average warmest month is July.
- The highest recorded temperature was 105°F in 1999.
- The average coolest month is January.
- The lowest recorded temperature was -17°F in 1989.
- November is the average wettest month.

Details | Video | Text | **Averages**

Saint Louis Classified Ads

JOBS | LAKE RENTALS | BEACH RENTALS

Find your dream job in: Saint Louis

Enter keywords: City: State:

Saint Louis MO SEARCH JOBS

Employers: To hire top employees in Saint Louis , click here.

weather.com® Business Travel Poll

Will you take a ski trip this winter?

- Yes
- No
- Haven't decided yet

Vote View Results

Business Travel Weather Features

Check airport conditions for Saint Louis, MO (63116)
OR
Find by airport:
Enter airport code GO!

- Travel Wise Forecast
- Local Interstate Forecasts
- Airport Impact Maps
- **Pinpoint Weather on Our All-New Map!**

Local Weather Site Web powered by Google

Enter ZIP or US / world city Search

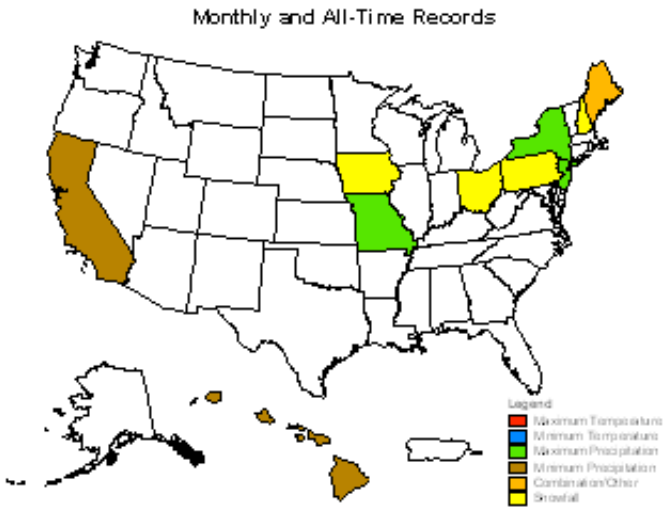
Weather	Downloads	Mobile	Weather Anywhere	International Weather
Top 100 Cities	Desktop Weather	Free Mobile Web	Weather on Your Website	Brazil
Search by State	IE Toolbar	Phone Downloads	Download Partners	France
Local Guides	Firefox Weather Extension	PDA Downloads	RSS Feeds	Germany
Weather Encyclopedia	Screensaver	Video	More Weather Tools	Latin America

APPENDIX B - LEED WATER EFFICIENCY CREDITS

Selected U.S. City and State Extremes

March 2008

Source NOAA/NWS Forecast Offices and compiled by NCDC.



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- Temperature / Dewpoint
- Rainfall / Thunderstorms
- Snowfall
- Wind
- Pressure
- Miscellaneous

Maps of Monthly and All-Time Records

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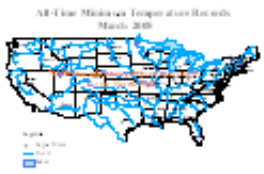

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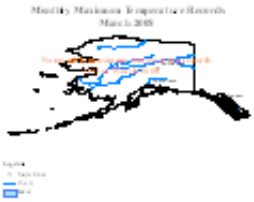
APPENDIX B - LEED WATER EFFICIENCY CREDITS



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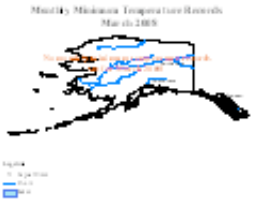

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For additional records not included in the selected list below please refer to the U.S. Records page.

Temperature / Dewpoint

Location	Record Type	New Record Date	New Record	Old Record	Old Record Date
None Reported.					

Rainfall

Location	Record Type	New Record Date	New Record	Old Record	Old Record Date
St. Louis Int'l AP, MO	Monthly rainfall record	March, 2008	8.40 inches	8.25 inches	March, 1897
Albany Int'l AP, NY	Third wettest March on record	March, 2008	6.21 inches	N/A	N/A;the wettest occured in 1843 with 7.37 inches
	Monthly				

PILOT GREY-WATER HARVESTING and USAGE STUDY: 05/01/06- 08/01/06

MECHANISMS:

- One Brac Systems B52 (W200) Harvesting, Storage and Transfer Station
- One Sump Pump

PILOT DWELLING:

- Single Family Home Located in Ruidoso New Mexico

NUMBER OF OCCUPANTS:

- Two adults and two teenagers

AVERAGE POTABLE WATER VOLUME USED DAILY

- One Jacuzzi Tub/Shower
    - Two Showers/day (one male & one female) = *50 gallons/day*
    - One Jacuzzi/week is 70 gallons or = *10gallons/day*
- One Bathroom Sink = *2 gallons/day*
- One Clothes Washing Machine
    - One large load of cloths daily = *55gallons/day*

AVERAGE TOTAL GREY-WATER HARVESTED OVER 90 DAYS

- Jacuzzi Tub/Shower = *60gal x 90days = 5,400 gallons*
- Bathroom Sink = *2gal x 90days = 180 gallons*
- Clothes Washing Machine= *55gal x 90days = 4,900 gallons*

Total = ***10,480 gallons***

AVERAGE TOTAL HARVESTED GREY-WATER USED OVER 90 DAYS

- One 1.5 gallon low flow toilet
    - 20 flushes/day = 30 gallons/day
    - 30 gal/day x 90 days = *2,700 gallons*

- Irrigation, fruit trees and landscape
    - 10,480 total gallons minus 2,700 toilet gallons = *7,780 gallons*

DATA ANALYSIS COMPARISONS AND OBSERVATIONS

During the term of this water conservation study, the local area was in a severe drought condition. As the statistics show most of the harvested grey-water was used for irrigation for plants and trees, which otherwise would have died from the drought conditions. Although the use of grey-water for irrigation depends on local laws, in areas of the country where grey-water can be used for irrigation, this one use of the Brac System can save homeowners and businesses hundreds of dollars on landscaping during unpredictable dry conditions, not to mention the benefit of water conservation for the municipality.

APPENDIX B - LEED WATER EFFICIENCY CREDITS

Year-over-Year comparison of water consumption from the Pilot Dwelling

(Hottest and Driest month of the year)

- Time period 06/01/05 - 06/28/05
  - Total volume of water used according to official records = ***17,870 gallons***
- Time period 06/01/06 - 06/27/06
  - Total volume of water used according to official records = ***5,340 gallons***

During this one month the total savings in dollars from June 2005 water usage compared to June 2006 water usage was $41.56, and I still have all my fruit trees and expensive landscaping, not to mention I saved 335% more water!

This Pilot Dwelling has only one Brac B52 unit that flushes only one toilet, the only low-flow toilet in the house. Two more toilets are flushed daily in the home along with another Shower/Tub being used daily. Soon a Brac B52 will be installed on this side of the house to harvest and use this grey-water.

OBSERVATIONS:

While irrigation is seasonal, flushing toilets is daily. The low-flow 1.5 gallon toilet in this Pilot Project saved 2,700 gallons for 90 days or 10,800 gallons per year. If just 1,000 Brac Systems were installed in severe drought areas without any irrigation benefits, the compounded water conservation using the Pilot Project low-flow toilet data would be 10,800,000 gallons of water per year. This is a very low estimate of the compounded effect possible with the Brac Systems. Most residents have two 3.5 gallon toilets and are flushing millions of gallons of water down the drain.

CONCLUSION:

Although this data reflects average estimated volumes, the conclusion is obvious:

Brac Systems save water and money. I am completely satisfied with the operation and performance of this cutting edge water conservation system. Every home and business should have one. The use of chlorine tablets and proper filter maintenance are the only service procedures necessary. Grey-water Harvesting using a Brac System is a water conservation milestone.

Rod Mays, President: AQUAsolutions

Water Conservation Consultant, Ruidoso New Mexico

http://www.aquasolutions.net/

Phone : 505-937-5841

Financial Assistance Opportunities

Missouri Department of Natural Resources

PUB000753

Introduction

This publication is made possible by the Missouri Department of Natural Resources. The department wants to provide information on its financial and technical resources. For more information about the financial opportunities listed in this brochure, call the Department of Natural Resources toll-free at 1-800-361-4827, or e-mail us at: contact@dnr.mo.gov.

The department offers numerous opportunities for financial assistance including tax credits and exemptions, loans and grants. These opportunities are available for private individuals, communities, organizations and companies. Assistance can range from help in rehabilitating a historic building or building an erosion-control structure, to building sewer and water systems and cleaning up leaking underground storage tanks.

Air Quality

- ***Air Pollution Control Sales Tax Exemption***
  Businesses may claim sales tax exemptions for equipment or devices designed and used solely for preventing, abating or monitoring air pollution. These may include machinery that analyzes emissions, controls air pollution from refrigerants or helps reduce air pollution in other ways.
  Contact: Air Pollution Control Program (573) 751-4817

Water Quality

- ***Drinking Water Operator Training Assistance***
  Program provides payment of all or part of training course fees for operators of drinking water systems serving communities with populations of 3,300 or less. Procedures for distribution of these funds are under development. It is anticipated that this activity will begin by July 2003.
  Contact: Water Protection Program (573) 751-1300

- ***Nonpoint Source (NPS) Animal Waste Treatment Facility Loan Program***
  Low-interest state revolving fund loans from DNR through the Missouri Agriculture and Small Business Development Authority (MASDBA) to small producers and farmers for design and construction of animal waste treatment facilities and application of best management practices. Applications obtained from the MASDBA for 100 percent of eligible costs. Loan interest rates at 5.3 to 5.8 percent.
  Contact: Water Protection Program (573) 751-1300

- ***Nonpoint Source (NPS) Minigrants***
  General guidelines same as NPS Project Grants; however, project length may not exceed 18 months. Maximum grant is $5,000 with a match requirement of 60 percent federal/40 percent nonfederal share of project total. There is no application deadline and awards are made quarterly.
  Contact: Water Protection Program (573) 751-1300

- ***Nonpoint Source (NPS) Project Grants***
  Grants are available to public institutions of higher education, units of government and nonprofit organizations with 501(c) status to provide information, education or technical assistance relating to nonpoint source water pollution, demonstrating alternative pollution prevention practices. Research or activities required under discharge permits are not eligible. Project length may be up to four years; awards are made annually and typically range from $5,000 to $500,000. Requests for proposals are issued in July with a November deadline.
  Contact: Water Protection Program (573) 751-1300

- ***Private Water Company Bond Financing Program***
  Bond financing is available through the Missouri Environmental Improvement and Energy Resources Authority (EIERA) for private water companies to assist in the construction of water delivery systems and wastewater treatment facilities. The amounts are based on the ability to repay debt and subject to allocation of private activity bonds. The program has an open application period.
  Contact: Environmental Improvement and Energy Resources Authority (573) 751-4919

- ***Rural Sewer Loan Program***
  Provides loans to rural communities and sewer districts for wastewater collection facilities. In November 1998, additional funds were approved by the voters. Actual loan award made after project is bid.
  Contact: Water Protection Program (573) 751-1300

- ***Small Borrower Loans***
  These water and wastewater loans are limited to communities of less than 1,000 people, with costs of less than $100,000. This is the same subsidy as the State Revolving Fund.
  Contact: Water Protection Program (573) 751-1300

- ***State Revolving Fund (SRF) Leveraged Loan Program – Drinking Water***
  Subsidized loans to any community water system and nonprofit noncommunity water system not federally owned for construction of drinking water facilities. Amounts are based on ability to repay debt. Application deadline is November 15. Administered jointly with the Environmental Improvement and Energy Resources Authority, the Clean Water Commission and the Safe Drinking Water Commission.
  Contact: Water Protection Program (573) 751-1300

- ***State Revolving Fund (SRF), Leveraged Loan Program – Wastewater***
  Subsidized loans to any political subdivision of the state for construction of wastewater treatment facilities and certain non-point source projects. Amounts are based on ability to repay debt. Application deadline is November 15. Administered jointly with EIERA and Clean Water Commission.
  Contact: Water Protection Program (573) 751-1300

- ***Small Borrowers Program-Drinking Water***
  This program makes low interest loans to municipalities and water districts that serve 1,000 or fewer people and wish to borrow $100,000 or less. The maximum loan term is 20-year term. The interest subsidy is the same as the drinking water state revolving fund leveraged loan program.
  Contact: Water Protection Program (573) 751-1300

- ***Direct Loans-Drinking Water***
  This program makes low interest loans to municipalities and water districts. Generally, the department will direct applicants without the financial capacity to participate in leveraged loans to this program. The maximum loan term is 20 years. The interest subsidy is the same as the drinking water state revolving fund leveraged loan program.
  Contact: Water Protection Program (573) 751-1300

- ***Storm Water Loan Program***
  Loans to first class counties, communities within first class counties and any city not within a county for storm water control plans, studies and projects.
  Contact: Water Protection Program (573) 751-1300

- ***Water Pollution Equipment Sales Tax Exemption***
  This is a tax incentive program that is available to individuals, corporations or any public entity that purchases machinery, equipment, appliances and devices used solely for the purpose of preventing, abating or monitoring water pollution. Qualifying equipment, devices, etc., would be exempt from state sales tax.
  Contact: Water Protection Program (573) 751-1300

Solid Waste Management and Recycling

- ***Market Development Financial Assistance Program***
  This program was established in 1990 by the Missouri General Assembly. Financial assistance is available for the purchase of equipment for final processing or manufacturing of marketable goods with recycled materials. The maximum amount is $50,000 with an open application process. EIERA holds a security interest in equipment for the contract term of two years. Also, technical assistance is available, through the Market Development Program, for universities, businesses and organizations for product research and market development.
  Contact: EIERA Market Development Program (573) 526-5555

- ***Scrap Tire Clean Up Reimbursement for Non-Profit Organizations***
  The Missouri Department of Natural Resources can reimburse fraternal, charitable or other non-governmental nonprofit organizations for disposal costs of scrap tires collected during voluntary cleanups of land and water resources. Organizations must be registered with the Secretary of State as a domestic nonprofit organization (501 3(c)) and must contact the department's Solid Waste Management Program prior to beginning the clean up. More details can be found at www.dnr.mo.gov/env/swmp/tires/tirecost.htm.
  Contact: Solid Waste Management Program (573) 751-5401

- ***Scrap Tire Playground Cover and Surfacing Grants***
  Scrap Tire Playground Cover and Surfacing Grants are available for the cost and delivery of scrap tire material for playgrounds, running tracks, walking trails or other surfacing projects approved by the department. All grant recipients are required to purchase scrap tire material from manufacturers whose scrap tire material contains at least 40 percent Missouri generated scrap tires. All projects must be located within the state of Missouri. Loose scrap tire playground cover must be eight inches deep and wire-free. Playgrounds, running tracks, walking trails and other surfacing projects using rubber mats or pour-in-place materials must conform to the manufacturer's specifications and be approved by the department. All financial awards are subject to the state of Missouri's legislative appropriation process, available funds and authorization for the projects administered by the Missouri Department of Natural Resources.

Public schools, private schools, parks, non-profit day care centers, other not-for-profit organizations and governmental organizations other than state agencies are eligible to submit applications.

Due to pending changes in the Americans with Disabilities Act rules, preference will be given to applicants requesting rubber mats or pour-in-place rubber materials. Grant recipients requesting rubber mats or pour-in-place rubber material are eligible to receive up to $10,000 while those requesting shredded material are eligible up to $5,000.
Contact: Solid Waste Management Program (573) 751-5401

- ***Solid Waste Management District Grants***
  These district grants return tonnage fees generated in the solid waste management regions to the solid waste management districts. The districts are responsible for soliciting and evaluating grant applications. The districts also are responsible for awarding the grants and distributing the funds in a ratio of up to 50 percent for district-wide projects and district operations and at least 50 percent for projects of cities and counties within the district.
  Contact: Solid Waste Management Program (573) 751-5401

Soil and Land Management

- ***Conservation Cost-Share Grant Program***
  These grants reimburse landowners for implementing practices that prevent or control erosion on agricultural land to maintain productivity of soil resources. The application process is ongoing. This program is funded by the Parks and Soils Sales Tax and administered through local Soil and Water Conservation Districts.
  Contact: Soil and Water Conservation Program (573) 751-4932

- ***Loan Interest-Share Program Grants***
  Loan interest-share payments are available to individuals for principal maximums of $25,000 for loans on private agricultural land for standard erosion control practices and specified conservation tillage equipment. This program is funded by the Parks and Soils Sales Tax and administered through local Soil and Water Conservation Districts.
  Contact: Soil and Water Conservation Program (573) 751-4932

- ***Research Grants***
  Grants are available to Missouri state colleges and universities for research projects to support goals of the Soil and Water Districts Commission. Applications must be submitted three or four months after initial Request for Proposal.
  Contact: Soil and Water Conservation Program (573) 751-4932

- ***Special Area Land Treatment Program (SALT) Grants***
  Cost-share grants are available to agricultural landowners. In addition, technical assistance and administrative grants to soil and water districts are available depending on the objectives of the watershed. This program is funded by the Parks and Soils Sales Tax and administered through local Soil and Water Conservation Districts.
  Contact: Soil and Water Conservation Program (573) 751-4932

Historic Preservation and Recreation

- ***Historic Building Rehabilitation Tax Credits***
  Federal and state investment tax credits are available for the rehabilitation of historic buildings. A 20 percent federal tax credit can be used for the rehabilitation of income-producing historic buildings. Missouri provides a 25 percent state tax credit for the rehabilitation of income-producing historic buildings. Owner-occupied historic residences also qualify for the Missouri credit. The state credits are administered by the Missouri Department of Economic Development and the State Historic Preservation Office while the federal credits are administered by the State Historic Preservation Office and the National Park Service.
  Contact: State Historic Preservation Office (573) 751-7860

- ***Historic Preservation Fund***
  Federal matching grants are available annually for the identification, evaluation, registration and protection of cultural resources. These grants, which are funded at a 60 percent grant share/40 percent local matching share, generally do not exceed $25,000. Grants are currently only available to certified local governments. Historic Preservation Fund grant applications become available in June of each year with preliminary applications due at the end of August.
  Contact: State Historic Preservation Office (573) 751-7860

- ***Historic Preservation Revolving Fund***
  Subject to the availability of funds, the Historic Preservation Revolving Fund provides funds for the acquisition and protection of endangered historic buildings. Preservation covenants are placed on any property assisted by the fund. Funding is available primarily to non-profits and/or governmental agencies. Properties must be eligible for listing on the National Register of Historic Places.
  Contact: State Historic Preservation Office (573) 751-7860

- ***Land and Water Conservation Fund***
  Federally funded grants are available to cities, counties and public school districts to be used for outdoor recreation facilities and land acquisition dedicated to public outdoor recreation use. The program requires a 55% match of funds.
  Contact: Grants Management Section (573) 751-0848

- ***Recreational Trails Program***
  Federally funded grants are available to private trail organizations and governments for trail construction and maintenance. The program requires a 20% match of funds.
  Contact: Grants Management Section (573) 751-0848

Hazardous Waste

- ***Petroleum Storage Tank Cleanup Assistance***
  Owners and operators of properties contaminated by leaking petroleum storage tanks may be eligible for monies from the Petroleum Storage Tank Insurance Fund for cleanup costs. Certain restrictions apply, and the owner or operator must pay the first $10,000 of eligible clean-up costs.
  Contact: Petroleum Storage Tank Insurance Fund 1-800-765-2765

- ***Brownfields/Voluntary Cleanup Program (BVCP) Financial Incentives***
  Financial incentives are available for some sites participating in the voluntary cleanup program. Incentives are offered and administered by the Missouri Department of Economic Development (DED) in cooperation with DNR. The incentives can take the form of grants, loans, loan guarantees and tax credits. They are available for sites that qualify for DNR's Brownfields/Voluntary Cleanup Program (BVCP) and DED's Brownfield Redevelopment Program.
  Contact: DED Finance Programs Section (573) 751-0717 or visit their Web site at [www.ded.missouri.gov/]

Energy Conservation and Efficiency

- ***Energy Efficiency Revolving Loans***
  Eligible applicants are K-12 school districts, city and county governments and public colleges and universities interested in increasing the energy efficiency of their buildings and reducing utility costs. These loans can finance part or all of the costs associated with efficiency projects in existing or new buildings. Loans are repaid from energy cost savings. Some restrictions apply to eligible projects and repayment terms. The Leveraged Loan Program is administered jointly with the Energy Center and the Environmental Improvement and Energy Resources Authority (EIERA).
  Contact: Energy Center (573) 751-2254

- ***Low-Income Weatherization Assistance Grants***
  Eligible applicants are low income elderly and physically disadvantaged residents. The grants provide long-lasting improvements to people's homes such as insulation, caulking, weather-stripping or heating system improvement on replacement. The program funds implementation, technical expertise and training to help residents spend less of their income on energy costs. Applications are submitted through local community action agencies located in all Missouri counties.
  Contact: Energy Center (573) 751-2254

General Financial Assistance

- ***Agriculture Loan Program***
  Loans are available to individual farmers for animal waste treatment facilities. This program is administered jointly by the Department of Natural Resources and the Department of Agriculture.
  Contact: Missouri Department of Agriculture (573) 751-2129

- ***Cooperative Remonumentation Program***
  Contracts are arranged with county commissions to remonument corners of the U.S. Public Land Survey System. The department pays a set amount per corner. County must have a county surveyor to do the actual monumentation. Requested due date annually on or before July 15.
  Contact: State Surveyor (573) 368-2300

- ***County Boundary Resurvey Program***
  Contracts are arranged with county commissions to remonument county boundary lines where the location of the line is indefinite. The department contracts for and pays the entire cost of surveying and monumentation subject to appropriations.
  Contact: State Surveyor (573) 368-2300

- ***Geodetic Control Densification Project***
  Contracts are arranged with county, city government and municipal utilities to establish horizontal and vertical control monuments used for mapping and the development of a land survey information system. The department provides all work for a fixed amount per project. This amount is negotiated at approximately one-third of the estimated total one-time cost of the entire project.
  Contact: State Surveyor (573) 368-2300

- ***Hazardous Substance Emergency Relief Loan Fund***
  Loans are available to political subdivisions or volunteer fire protection associations for reimbursement of actual costs incurred in responding to a hazardous substance emergency.
  Contact: Environmental Services Program (573) 526-3384

- ***Local Government Reimbursement Program***
  Local communities can be reimbursed up to $25,000 for costs incurred in responding to a hazardous substance emergency. Request for reimbursement must be for response costs and services provided that were not budgeted, e.g. contractor cost, disposal cost, etc. This does not include incidents involving only petroleum or petroleum-related products.
  Contact: U.S. EPA, Local Government Reimbursement Helpline 1-800-431-9209

- ***Private Activity Bond Financing***
  Issuance of tax-exempt and taxable revenue bonds in cooperation with the Department of Economic Development for private and public companies for certain facilities and improvements with environmental and energy resource impacts. These projects must meet the Environmental Improvement and Energy Resources Authority's (EIERA) statutory requirements as well as all applicable federal and state tax law provisions.
  Contact: Environmental Improvement and Energy Resources Authority (573) 751-4919

Discover related financial assistance opportunities with the following agencies:

• Missouri Department of Economic Development	(573) 751-4962
• Business Programs	(573) 751-4539
• Community Programs	(573) 522-6155
• Missouri Department of Agriculture	(573) 751-2129
• Missouri Department of Conservation	(573) 751-4115

SAMPLE FORM - LEED WATER EFFICIENCY CREDITS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION BRANCH

REQUEST FOR APPROVAL UNDER 10 CSR 20-6.030 DISPOSAL OF WASTEWATER IN RESIDENTIAL HOUSING DEVELOPMENTS

FOR OFFICE USE ONLY
PROJECT ID NUMBER
DATE RECEIVED

SUBDIVISION OR DEVELOPMENT LOCATION

SUBDIVISION OR DEVELOPMENT NAME

¼ ¼ ¼ SECTION	¼ ¼ SECTION	¼ SECTION	SECTION	TOWNSHIP	RANGE	QUADRANGLE NAME

WRITTEN LOCATION IF LEGAL DESCRIPTION IS UNAVAILABLE

COUNTY

DEVELOPER INFORMATION

DEVELOPER NAME	TELEPHONE NUMBER	DATE	
DEVELOPER ADDRESS	**CITY**	**STATE**	**ZIP CODE**

DEVELOPMENT INFORMATION

TYPE OF PROPOSED WATER SUPPLY TO BE USED

☐ Community Public Water Supply, Name _____ ☐ Community Well, Owner/Operator _____

☐ Non-Community Public Supply, Owner/Operator _____ ☐ Individual Domestic Wells ☐ Multi-Family Water Wells

☐ Individual Well Domestic Wells with Full Length Grout

TOTAL SIZE OF DEVELOPMENT

_____ Number of Acres _____ Number of Lots

THE FOLLOWING DOCUMENTS AS DESCRIBED IN 10 CSR 20-6.030 MUST BE ENCLOSED.

☐ Geohydrologic Evaluation ☐ Soils Report ☐ Plat Map

COMMENTS

I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete and accurate.

DEVELOPER'S SIGNATURE	DATE

MAIL COMPLETED COPY TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, WATER PROTECTION PROGRAM, WATER POLLUTION BRANCH, P.O. BOX 176, JEFFERSON CITY, MO 65102-0176
PHONE: 1-800-361-4827 or (573) 751-1300 FAX: (573) 526-1146

Cellophane House
The Museum of Modern Art, New York, NY

Cellophane House is a five-story, offsite fabricated dwelling commissioned by the Museum of Modern Art's exhibition *Home Delivery: Fabricating the Modern Dwelling*, on display July 20 through October 20, 2008. The 1800 square-foot residence has two bedrooms, two bathrooms, living and dining space, a roof terrace, and a carport. An online journal tracking the fabrication process can be viewed at www.moma.org/homedelivery.

Concept
A building is, at root, nothing more than an assemblage of materials forming an enclosure. We recognize that these materials came from somewhere, are held together for a time by the techniques of construction, and will at some future time transition into another state. While we tend to think of buildings as permanent, they are in fact only a resting state for materials, a temporary equilibrium that is destined to be upset by the entropic forces that drive the physical universe.

[+] view time lapse assembly

Exhibition View

[+] read more

Materials and Resources

MR 1.1 – Framing Order Waste Factor Limit (Prerequisite)

The waste overall estimated waste factor is less than 10% due to modular, prefabricated construction. This waste factor is defined as the percentage of framing material ordered in excess of the estimated material needed for construction.

MR1.5- Off-site Fabrication (4 points)

Modular, prefabricated construction is being used as an alternative to on-site framing. All principal building sections will be delivered to the job site as prefabricated modules. Modular homes are houses that are divided into multiple modules or sections which are manufactured in a remote facility and then delivered to their intended site of use. The modules are assembled into a single residential building using either a crane or trucks. Such dwellings are often priced lower than their site-built counterparts and are typically more cost-effective to builders and consumers. These new homes can be constructed in less time than it takes to build a home "on-site". Manufacturers site the following reasons for the typically lower cost/price of these dwellings:

- Indoor construction. Assembly is independent of weather which increases work efficiency and avoids damaged building material.
- Favorable pricing from suppliers. Large-scale manufacturers can effectively bargain with suppliers for discounts on materials.
- Ability to service remote locations. Particularly in countries such as Australia there can be much higher costs to build a site-built house in a remote area or an area experiencing a construction boom such as mining towns. Modular homes can be built in major towns and sold to regional areas.
- Low waste. With the same plans being constantly built, the manufacturer has records of exactly what quantity of materials is needed for a given job. While waste from a site-built dwelling may typically fill several large dumpsters, waste from a modular dwelling generates much less waste.

MR2.1- FSC Certified Tropical Wood (Prerequisite)

All wood used in construction of prefabricated, modular homes is FSC certified tropical wood.

MR2.2- Environmentally Preferable Products (6 points - .5 points each)

Our home design contains building component materials made up of 90% of components by weight or volume. A single point that meets each criterion (environmentally preferable, low emissions, and local sourcing) can earn points for each. The products chosen are either environmentally preferable or locally produced, meaning the products were extracted, processed, and manufactured within 500 miles. Some of these products include: concrete foundation walls with use of 30% fly ash, FSC wood frame walls, bamboo floor, aggregate cement, low voc paint, recycled roofing, etc.

Examples of Environmentally Preferable Products to use in home:

- Exterior Insulation and Finish Systems (StoTherm ™ Insulated Panels)
  EIFS are a type of building product that provides exterior walls with an insulated finished surface, and waterproofing in an integrated composite material system. Exterior Insulation and Finish Systems are available in drainable or barrier systems that resemble traditional masonry stucco finishes. Both types of EIFS are high-end products, with installed prices often similar to those of brick veneer. Drainable EIFS can cost between $4.50 and $7.50 per square foot, roughly $1.00 or more per square foot than barrier systems. In comparison, the installed cost of vinyl siding is about $1.50 to $4.00 per square foot. (See Appendix diagrams)

- Green Roof (Garden Roof ™)
  A green roof is a roof of a building that is partially or completely covered with vegetation and soil, or a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. (See Appendix for catalogue)

- FSC Certified Wood Framing/ Trim
  FSC provides standard setting, trademark assurance and accreditation services for companies and organizations interested in responsible forestry. Products carrying the FSC label are independently certified to assure consumers that they come from forests that are managed to meet the social, economic and ecological needs of present and future generations.

- Fly-Ash Concrete Foundation
  Fly ash is one of the residues generated in the combustion of coal. Fly ash is generally captured from the chimneys of coal-fired power plants, whereas bottom ash is removed from the bottom of the furnace. In the past, fly ash was generally released into the atmosphere, but pollution control equipment mandated in recent decades now require that it be captured prior to release.

- Bamboo Flooring (Duro Design ™)
  Bamboo is not only beautiful, it is also quite durable. Bamboo has received hardness (strength) ratings higher than many hardwoods. In addition to its hardness rating, bamboo is also resilient. This means it "bounces back" after most impacts and doesn't dent. This resiliency is also better for your feet and back since the floor will tend to "give" slightly and not be so hard to walk on every day. Bamboo is typically harvested every four to five years without actually destroying the plant. Also, because of its resiliency, bamboo doesn't have to be refinished as often as hardwood. This cuts down on the chemicals necessary to maintain the floor. (See Appendix for Specifications).

- Low VOC Paint (Yolo Colorhouse®)
  Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. The YOLO Colorhouse Inside formula is zero VOC, and 100% acrylic to ensure lasting performance. With 40% volume solids, YOLO Colorhouse Inside has excellent hide and layout.

MR3.1- Construction Waste Management Planning (Prerequistite)

Project waste will be diverted to local recycling facilities. This includes cardboard packaging, household recyclables, etc.

MR3.2- Construction Waste Reduction (3 points)

Construction waste is reduced to 2.5 pounds or less of net waste per square foot of conditioned floor area due to prefabricated home construction.

Sto Corp. | **Exterior**

StoTherm™ Insulated Wall Claddings

Advanced Performance and Design Versatility

StoTherm™ Insulated

Why Sto?

Sto is the innovative world leader in cladding, coating and restoration systems. Sto was a pioneer in advanced coatings and building technologies in Europe long before coming to North America in 1979. Sto was there at the beginning, bringing Exterior Insulation and Finish Systems (EIFS) to the European market in 1963 and is the world's largest producer of these claddings today. Befitting a new millennium, Sto introduces StoTherm NExT, with the benefits of a StoTherm Insulated Wall Cladding plus superior waterproofing/air barrier for extra protection and outstanding insulation value.

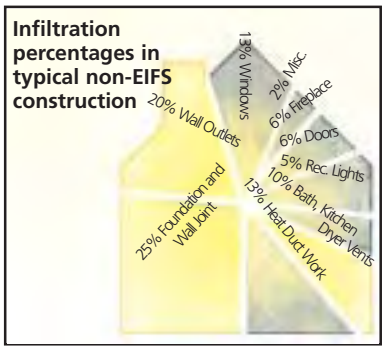
Why StoTherm™ EIFS?

StoTherm EIFS gives you the freedom of design that no other cladding material can offer. Your possibilities in colors, details, form and texture are endless. StoTherm also provides your building with a protective blanket of continuous insulation, and enables excellent strength-to-weight ratios. So your building will not only be beautiful, but well-insulated, cost-effective and lasting. Why StoTherm? The question should be, "Why choose anything else?"

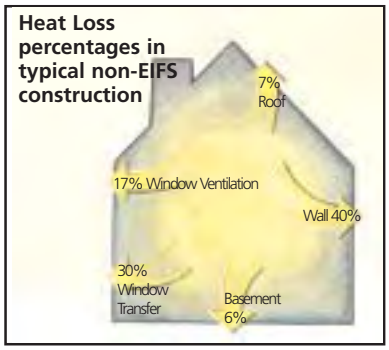
StoTherm™ Insulated Wall Claddings Provide Energy Efficiency and Comfort

Superior Value in a Superior Wall Cladding

A proven choice for all climates and substrates, StoTherm Claddings are advanced wall cladding assemblies engineered for performance, design freedom, and durability. Whatever your project, StoTherm provides the best value in a wall cladding–integrated Wall Claddings of unequaled aesthetic and technological elegance that are user friendly to install and cost-effective.



Reduced Air Infiltration and Heat Loss

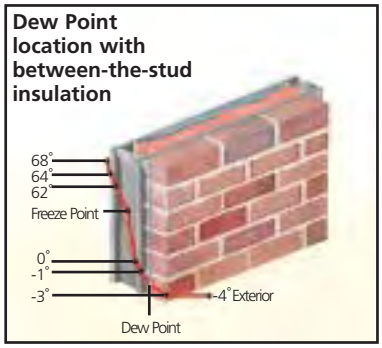


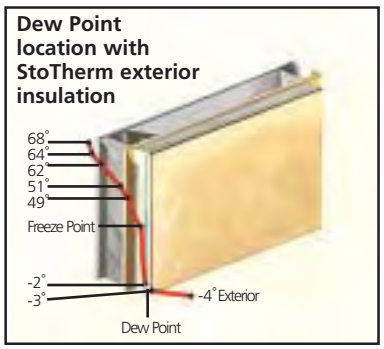
Continuous exterior insulation provides significant energy savings and superior interior climate control and comfort.

- Exterior air and moisture infiltration at foundation and wall joints, wall outlets and vents is reduced by as much as 55%, compared to typical construction.
- Heat loss through the walls, which accounts for up to 40% of heat loss in non-EIFS construction, is greatly reduced.

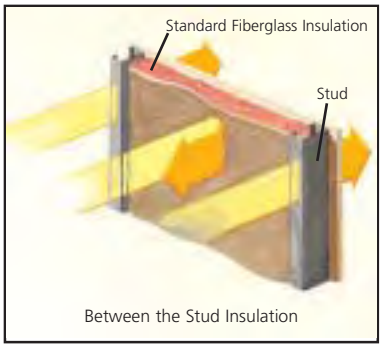
A Dew Point Located Outside the Wall Assembly

The dew point is the temperature, at a given relative humidity, where water vapor condenses. As the diagrams show, a StoTherm Insulated Wall Cladding moves the dew point outside the wall, greatly reducing the possibility of moisture condensing and possibly freezing inside the wall and causing damage.



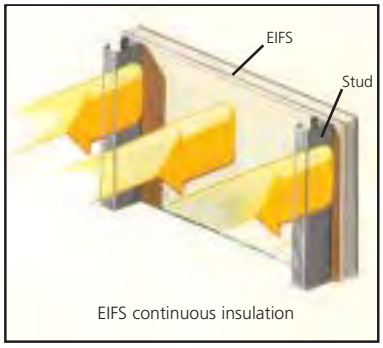


Wall Claddings



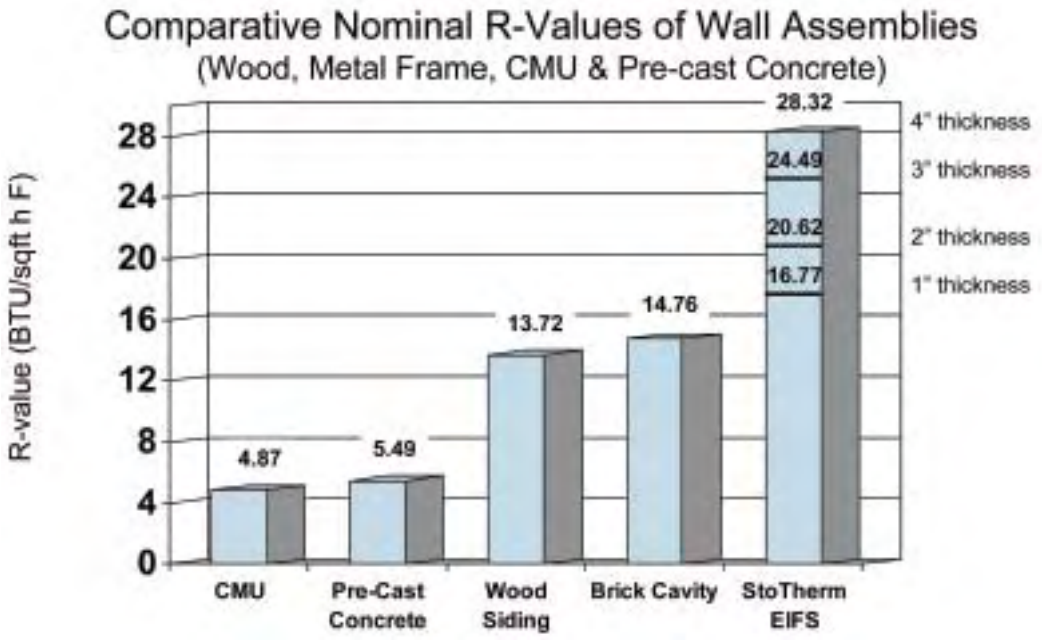
Superior Insulation

StoTherm Insulated Wall Claddings offer better insulation and higher R-values because rigid expanded polystyrene (EPS) boards are attached adhesively as a continuous blanket around the exterior of the structure, eliminating the many thermal breaks characteristic of between-the-stud insulation and claddings attached with nails and screws. A broad range of R-values can be attained by using EPS in varying thickness from 3/4"to 4" (19-102 mm). Research conducted by Oak Ridge National Laboratory in 2005/2006 affirmed that "insulation is more beneficial when placed toward the exterior."

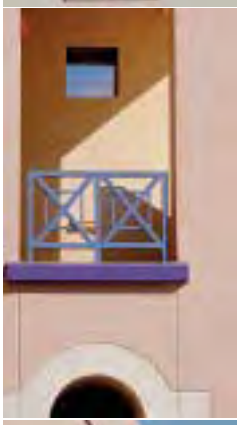


More Efficient Control of Temperature Differentials That Can Cause Thermal Shock

Thermal shock is the sudden and potentially damaging expansion or contraction of wall surfaces in response to extreme changes in temperature. When a building is enveloped with a StoTherm Insulated Wall Cladding, the most dramatic temperature changes take place in the exterior insulation blanket and the StoTherm EIFS wall assembly remains flexible enough to expand and contract, protecting the building's structure from damage and keeping inside wall temperatures more constant and comfortable. The Oak Ridge National Laboratory study published in 2006 concluded that walls clad with EIFS provide "superior moisture and temperature control" compared to several other common types of wall construction.



Note: R-Value in the case of the framed wall assemblies in the charts refers to average R- value. Wall assemblies from exterior to interior are:
CMU: Nominal 8" hollow core painted CMU with expanded perlite insulation in hollow cores, 0.75" air space and ½" gypsum interior wall board
Pre-Cast Concrete: 4" painted pre-cast concrete panel with 1" EPS insulation and ½" gypsum wall board interior.
Brick Cavity: Nominal 4" face brick with 2" cavity, building paper, 5/8" gypsum sheathing, metal studs with R-11 batt insulation and ½" gypsum wall board interior
Wood Siding: ½" lap siding, ½" plywood sheathing, building paper, metal studs with R-11 batt insulation, ½" gypsum wall board interior
Sto System 1" StoTherm EIFS, ½" plywood sheathing, metal studs with R-11 batt insulation, ½" gypsum wall board interior.



StoTherm™ Claddings Provide Low Maintenance and Long-Term Durability

Sto's coatings and finishes, with their advanced 100% acrylic and silicone chemistry, look new longer. They resist fading, peeling, cracking, dirt pick-up, mildew, mold and other biological growth. They are easily cleaned by low pressure power washing with water and a mild detergent to extend the lifecycle to recoating. If a new look is desired, recoating a StoTherm Cladding is simple and cost-effective. Structures clad with StoTherm can be easily inspected and maintained on a regular basis to insure long-lasting beauty and integrity.

StoTherm™ Features Economic Installed Cost

The installation of StoTherm Wall Claddings translates into savings in production time and labor.

- Production is easily sequenced for efficiency.
- The availability of Sto's fast-setting 1/2 Time products can enhance the quality and speed of installation in cold or damp weather and climates.
- The low installed costs and durability of StoTherm reduce the lifecycle cost of the wall cladding.
- StoMachine Technology offers faster installation times and dramatic cost savings for projects large or small.

StoTherm™ Provides Design Freedom and Versatility

StoTherm Insulated Wall Claddings provide freedom of design well beyond what other claddings can offer. Form, details, color and texture offer the architect endless possibilities.

Features such as curves, quoins, arches, reveals, accent bands and sculptured details are easy and economical to fabricate and install. This flexibility enables the architect to work within a wide range of architectural styles as well as to realize his or her unique creative vision.

Finishes featuring pure white marble aggregate, 100% acrylic polymers, a variety of textures and integral colors enhance the design and harmonize with the surrounding environment. StoTherm offers virtually unlimited color choice at no additional cost.

PROJECTSPOTLIGHT

HYDROTECH®

American Society of Landscape Architects

Washington, D.C.

Owner
American Society of Landscape Architects

Architect
DMJM / AECOM

Landscape Architect
Michael Van Valkenburgh Associates

General Contractor
Forrester Construction Company

Hydrotech Applicators
Magco Inc.

Year Completed
2006

Waterproofing/Roofing Area
3,800 SF Garden Roof®

Hydrotech Products
Monolithic Membrane 6125®-EV
Hydroflex® RB
STYROFOAM® Insulation (supplied)
Moisture Retention/Drainage Panels
LiteTop® Engineered Soil
GardNet™ Soil Confinement
GardMat™ Wind Erosion Protection

When the American Society of Landscape Architects (ASLA) wanted a high profile location to best demonstrate how landscape architects play a central role in green roof design and construction, it needed to look no further than atop its own headquarters building. And, when ASLA wanted an engineered assembly that would allow it to show how environmental and aesthetic benefits of a green roof can best be maximized, it needed to look no further than the Garden Roof® Assembly from American Hydrotech.

The previous black tar surfaced roof of the ASLA headquarters building in Washington, DC, is now a landmark demonstration project, containing six distinct Garden Roof conditions, representing extensive, semi-intensive, and intensive systems ranging in growing media depths of 3 - 18 inches. Two "waves" dominate the design and allow for the greatest green coverage possible for the 3,300 square-foot roof surface. Surrounding these is a third green roof system, covered by metal grating that allows visitors to walk over the planted material. The Garden Roof Assembly plays an integral and essential role in the roof's design.

"We chose this assembly because of its stormwater management capabilities as well as its ability to improve the building's energy efficiency," Nancy Somerville, executive vice president and CEO of ASLA, said of ASLA's decision to go with the Garden Roof Assembly. "American Hydrotech lends a great deal of technical expertise to its projects and provides an outstanding warranty."

MM6125®EV-FR, a seamless waterproofing/roofing membrane is protecting the integrity of the overstructure. And, to effectively confine and stabilize the growing media on the sloped "waves" GardNet™ was installed. This unique component of the Garden Roof Assembly allows design professionals to expand beyond traditional flat roof applications, up to a 7:12 roof pitch.

American Hydrotech, Inc.
303 E Ohio Street, Chicago, IL 60611
800.877.6125
312.661.0731 (fax)

Hydrotech Membrane Corporation
10,951 Parkway, Ville D'Anjou
Quebec, H1J 1S1
800.361.8924; 514.354.6649 (fax)

www.hydrotechusa.com
Please visit our website or call for information on Hydrotech's full line of high-performance construction products

St. Louis LEED Fact Sheet

St. Louis Regional Chapter,
U.S. Green Building Council
For more information visit our website at:
http://chapters.usgbc.org/stlouis/

ST. LOUIS REGIONAL CHAPTER

Transforming the Built Environment

What is LEED®?

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

St. Louis Regional Chapter Facts

- St. Louis has been selected as the host city for the 2008 Greening the Heartland Conference.
- The St. Louis Regional Chapter now has over 500 members.
- The St. Louis Chapter was presented with an award in the LEED category at Greenbuild in 2006.
- In March, 2007 Ameren UE and the U.S. Green Building Council-St. Louis Regional Chapter presented $90,000 in LEED "Scholarships" to 18 project owners and developers seeking to build green. The funds will be distributed once the projects achieve LEED certification.
- St. Louis is one of only four chapters nationally to be awarded the $25,000 Chapter Challenge Grant.

In the U.S., Buildings Account for:

→ 36% of total energy consumed
→ 30% of greenhouse gas emissions
→ 30% of raw materials use
→ 30% of waste output/136 million tons annually
→ 12% of potable water
→ 65% of electricity consumption

Environmental benefits of Green Buildings:

→ Enhance and protect ecosystems and biodiversity
→ Improve air and water quality
→ Reduce solid waste
→ Conserve natural resources

Economic benefits of Green Buildings:

→ Reduce operating costs
→ Enhance asset value and profits
→ Improve employee productivity and satisfaction
→ Optimize life-cycle economic performance

Municipal Green Building

The Cities of Clayton and St. Louis recently adopted LEED as **THE** standard for all newly constructed city-owned facilities greater than five- thousand (5000) square feet in size.

The bills require that buildings meet the LEED Silver level of certification as a minimum threshold of building performance.

St. Louis LEED Certified Projects

(Last update August, 2007)

PLATINUM
Alberici Corporation
Alberici Headquarters

21 O'Fallon Building
William A. Kerr Foundation

≈

SILVER
Centocor BioLogics, LLC
Office Fitout

Enterprise Rent-a-Car
Fleet Operations Relocation

Monsanto, Nidus Center for Scientific Enterprise

Tarlton Corporation
Headquarters

≈

CERTIFIED
Anheuser-Busch Technology Center

HOK St. Louis Office

Sisters of Mercy Convent

Washington University Earth and Planetary Sciences Building

CORTEX I Core & Shell

Roberts Tower Marketing Center

Please reprint on recycled paper

Become a USGBC-St. Louis Regional Chapter member today – go to http://chapters.usgbc.org/stlouis/join/html to learn more!

Overview of Initiative for Affordable Housing

- **What are the objectives of the Initiative for Affordable Housing?**

  The Initiative for Affordable Housing is a component of LEED for Homes that addresses the inherent differences between affordable housing – particularly multi-family homes – and market-rate, single-family homes. It is being funded by a generous grant provided by The Home Depot Foundation. The ultimate goal of this initiative is to recognize and reward the intrinsic resource efficiencies of affordable housing in the LEED for Homes rating system. In this way, USGBC and The Home Depot Foundation will promote sustainable building practices specifically for affordable homes.

- **How does the Initiative for Affordable Housing fit within the scope of the LEED for Homes program?**

  LEED for Homes is a collaborative initiative that actively works with *all sectors of the home building industry*, including the affordable housing sector. LEED for Homes is a voluntary initiative designed to promote the transformation of the mainstream home building industry toward more sustainable practices.
  LEED for Homes certification requirements include several measures specifically intended to reward efficiencies typical of affordable projects:

  - ☐ Compact developments (up to 3 points);
  - ☐ Site selection and close to existing infrastructure (up to 3 points)
  - ☐ Limit outdoor water use (automatically earned by compact developments —1 point);
  - ☐ Homes with ready access to community resources and open spaces (up to 3 points); and
  - ☐ Homes that are smaller than the national average (up to 10 points).
  - ☐ Collectively these measures represent more than 50 percent of the points needed to achieve a certified LEED Home.

- **Why should I build LEED for Homes qualified affordable housing?**

  A home is not affordable if it is not energy efficient, healthy and durable. Affordable homes that are certified under the LEED for Homes Program will be distinguished in their markets as environmentally responsible and higher quality products. LEED-rated homes benefit residents directly because the LEED Rating System incorporates prerequisites related to occupant health and well-being. In addition, the mandatory energy-related prerequisites ensure at least 20-30% energy savings (relative to the national energy code). Additional energy measures can result in 30 to 70% reductions in energy costs. The selection of

sustainable materials, recommended in LEED for Homes, provides improved durability and is more environmentally responsible.

- **How will the quality of LEED Homes be assured?**

  The strength of LEED for Homes is third-party verification. This verification process includes both on-site inspections to ensure that the LEED for Homes features have been installed correctly and performance testing to ensure proper performance. LEED for Homes Providers are local and regional organizations that are selected to provide technical, marketing and verification support services to builders. A Provider arranges for certain performance tests to be conducted on the home. When all of the LEED for Homes features are verified, the USGBC issues a rating certificate for that qualified LEED Home.

- **How do I participate in LEED for Homes?**

  Affordable housing developers interested in participating in LEED for Homes should contact a Provider. A list of Providers can be found at www.usgbc.org/leed/homes. Once the Provider approves the project to move forward, the project team can register the project online.

- **What kind of funding is available to affordable housing projects?**

  If the builder/developer organization is a 501(c)(3) nonprofit organization the USGBC registration fee will be waived. In order to take advantage of this waiver, mark the project as affordable on the registration form, and the project will be registered without payment.

  In addition to waiving the registration fee, assistance is available through a generous grant from The Home Depot Foundation to cover verification costs associated with LEED certification. Contact your Provider for more information on how to qualify for this assistance.

- **LEED for Homes contact information**

  For questions about LEED for Homes, please e-mail homes@usgbc.org or contact your Provider.

EcoUrban Homes

3140 Pennsylvania Avenue

Missouri Native Plant Landscape

The plants within the gardens of this home are all native to Missouri. Not only are they "green", they are attractive, tough and resilient to our climate, so easy to grow and maintain! They are well adapted to our extreme fluctuations of temperature and rainfall. They 'belong' here as do the birds and butterflies they will attract. Enjoy this native environment and the time and money you will not be spending on a lawn!

*Plants of Interest in the Front Garden :

Fringe Tree (Chionanthus virginicus) – This lovely small tree in front of the window has showy, delicate, drooping bundles of fragrant, strappy-petalled white flowers in spring. Grows from 12-20 ft. tall with a round/oval habit.
Clove Currant (Ribes odorata) – Also known as the Golden Currant, this native gem planted on the NW corner of the house has wonderfully fragrant golden yellow flower clusters in April-May that resemble miniature trumpets. Yellow-red leaves in fall. The sweet black fruit is ¼", and was enjoyed by the Indians & settlers of the Great Plains prairies. Birds like them too!
Prairie Dropseed Grass(Sporobolus heterolepis) – A fine textured native grass that gives a gentle fountain-like appearance is planted along the front of the house and to the right of the stairs at sidewalk level. Produces a delicate display of seedheads in late summer-fall.
Prairie Blazingstar (Liatris spp.) – Three different species of this elegant plant are planted with the Prairie Dropseeds to create added excitement when their tall purple spikes of flowers come into bloom mid-summer-early fall. Gold finches and butterflies love this flower!
Missouri Primrose (Oenothera missouriensis) – Large single yellow cup-shaped flowers adorn this 8" trailing plant all summer long. A 'tough cookie' in the garden with interesting winged seedpods.
Butterfly Milkweed (Asclepias tuberosa) – A bright orange blooming knockout that everyone will be asking about and the butterflies will be sure to find.

*Plants of Interest in the Back Garden :

Yellowwood Tree (Cladrastus lutea) – This excellent specimen native tree deserves the prominent position it has in the back garden! Its smooth, muscular grey bark gets better with age as do the lovely pendulous panicles of fragrant creamy-white flowers in May-June. All this and it will provide the shelter and shade you'll enjoy during our hot summer days and nights!
American Beautyberry (Callicarpa americana) – These shrubs will create lots of interest and conversation in the fall when they show off their clusters of brilliant purple/magenta berries that literally encircle their stems. The rest of the year they'll be screening the A/C unit dutifully.
***Missouri Native Plant Rain Garden ***
This garden is full of wonderful native plants that will 'work' whenever needed to help utilize any storm water runoff throughout the seasons. The roots of these plants will 'take up' periodic excess water (during storms) and thrive just fine when dry as well. An easy and sustainable approach to a common, natural occurrence. Cardinal flowers, sedges, hibiscus, iris, asters, button bush and more!

B-NATURESCAPING

Naturescaping

An appreciation of our natural landscape leads many of us to want to capture nature's beauty in our home gardens. Naturescaping is a landscaping approach that focuses on working with the natural character of the land, rather than trying to transplant species that are not native or adapted to the natural conditions. In short, naturescaping is the arrangement of native plants in the garden in a way similar to their arrangement in nature.

Naturescaping provides many benefits to the home gardener including the opportunity to integrate nature into our daily lives and bring conservation closer to home. By recreating the prairie, meadow or woodland which once characterized your region, you can rediscover the past, promoting a "sense of place" and a tie to the land where you live.

Native plants make excellent landscape plantings because they are adapted to the local weather and soil conditions. Consequently, they require little or no fertilizer, are relatively low maintenance and help conserve scarce resources such as water and energy. Native plants are also less frequently bothered by insect and disease problems thus reducing the need for chemical controls.

The principal of naturescaping relies on increased species diversity and natural predation to keep pest populations in check. Pesticide use is strongly discouraged as it harms beneficial insects such as lady bugs, dragon flies and praying mantis. Pesticide use also reduces pollinator and local butterfly populations significantly.

One of the most important reasons for using native plants in the landscape is to increase public awareness about saving native organisms and their habitats. A garden of native plants preserves habitat for many native birds, insects and mammals that are becoming as rare as the plants and natural environments that feed and shelter them.

Native Plants in the Home Landscape

You can create a beautiful garden with native plants wherever you live. Begin by determining how you want to use native plants in your garden. The most important rule of thumb is to choose plants that will tolerate the conditions available in your landscape. Height, color and time of bloom are also important considerations when selecting native plants for the home landscape. Learn to recognize the native plants that may already exist in your garden such as phlox, black-eyed Susan, butterfly weed, coreopsis, bee balm, deciduous holly and viburnum. On a small scale, you can incorporate a few favorite natives into existing plantings. Or you can devote an entire garden or landscape to native plants.

For gardeners who wish to devote a large portion of their landscape to native plantings, it is helpful first to explore local native plant communities. Conservation organizations, such as the Missouri Department of Conservation, can help you find natural plant communities to explore.

Urban gardeners who may not have the room to recreate an entire plant community can still create the essence of the community by using the dominant native plants as the backbone of their landscape design. Some municipalities may have height restrictions in regard to vegetation. Be sure to check local weed ordinances before beginning any naturescaping project.

Conservation and the Home Landscape

The recent enthusiasm for naturescaping has created a demand for a wide range of native plants. In some cases, these plants are collected from the wild rather than propagated in a nursery. In order to conserve our native flora, gardeners should purchase nursery-propagated plants only.

There are several ways to ensure that the plants you purchase are nursery propagated. Check plant labels and catalogs for information on the source of the plant. Beware of ambiguous phrases such as "nursery-grown" which could mean that the plant was dug from the wild and then transplanted in the nursery.

Get to know your nursery person and ask questions about plant production. Price can be a good indicator. Plants, such as Trillium spp. that take several years to grow from seed, will cost far less when dug from the wild. Some plants that are particularly prone to poaching include cacti, orchids, insectivorous plants and medicinal plants.

A satisfying and easy way to acquire natives is to collect seeds and grow your own. If you decide to collect seed from the wild, follow ethical practices and never collect more seed than you can grow. Always get landowner permission before collecting on private property.

While collecting seed of common wildflowers is acceptable, it is extremely harmful to natural populations of rare and endangered species. In Missouri, contact the Department of Conservation for collection regulations and a list of threatened and endangered plants.

Planting Your Native Wildflower Garden

The Perennial and Mixed Border

Native plants will coexist quite happily with non-natives in the perennial or mixed border. When combining native and non-native plants in the same garden area, be certain to group together plants that have the same specific cultural requirements. Choose woodland wildflowers for the shade garden or gardens located in moist or wet areas; chose meadow, prairie or glade wildflowers for the sunny garden.

When incorporating natives into existing plantings, it is advisable to purchase containerized plants. Follow the planting directions provided by the nursery. While plants may be purchased through mail-order, it is best to buy plants from a local source whenever possible. These plants are more likely to be genetically adapted to your region's climate and other environmental conditions.

Woodland Wildflowers

Woodland wildflowers will be best suited to your landscape if your yard is shady and wooded. Most woodland wildflowers prefer well-drained soil, light shade

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and adequate moisture. They will also benefit from a soil high in organic matter as well as a leaf mulch that persists throughout the year.

There are several things to consider before purchasing woodland wildflowers for the home landscape. First, determine whether your wooded area contains wet or dry shade. Rocky outcroppings, white oaks and hickory trees are good indicators of dry shade conditions. Season of bloom is another important consideration in the woodland garden; as many of the woodland wildflowers are spring ephemerals with short-lived bloom periods. Woodland wildflowers are best purchased as containerized plants which establish themselves more reliably than plants started from seed. Finally, select plants from a local nursery as they are more likely to be suited to the growing conditions in your area.

Native Missouri Plants for the Woodland Garden

*denotes dry shade

Botanical Name	Common Name	Height (in ft.)	Bloom Period	Bloom Color
Grasses				
Chasmanthium latifolium	Northern Sea Oats	3	Aug-Oct	beige
**Hystrix patula*	Bottlebrush Grass	3	Aug-Oct	beige
Shrubs				
Aesculus pavia	Red Buckeye	16	April-June	red
Cephalanthus occidentalis	Buttonbush	5-7	June-August	white
Cornus amomum	Silky Dogwood	10	June	yellowish white
Corylus americana (dry or moist)	American Hazelnut	9	Feb-April	red/light yellow
Lindera benzom	Spice Bush	15	March-April	yellow
**Symphoricarpos orbiculatus*	Coralberry	6	July-August	green/pink violet
Wildflowers				
Amsonia tabemaemontana	Blue Star	3	April-May	blue
Anemone canadensis	White Anemone	1	May-July	white
**Anemonella thalictroides*	Rue Anemone	0.5	April-May	white, pale pink
**Aquilegia canadensis*	Columbine	1-2	April-July	scarlet/yellow
Arisaema triphyllum	Jack-in-the Pulpit	1-3	May-June	purple, white
Asarum canadense	Wild Ginger	0.5	April-May	brown
**Aster anomalis*	Weird Aster	2-3	Sept.-Oct.	blue
**Aster patens*	Spreading Aster	2-3	Sept.-Oct.	blue
Chelone obliqua	Rose Turtlehead	2-4	Aug.-Oct.	pink
Cimicifuga americana	Bugbane	2-4	Aug.-Sept.	white
Dicentra cucullaria	Dutchman's Breeches	1-2	March-May	white
**Echinacea purpurea*	Purple Coneflower	3	May-Oct.	pinkish purple
Erythronium albidum	Dogtooth Violet	0.5	March-May	bluish-white
**Geranium maculatum*	Cranesbill Geranium	1-2	April-June	pink, blue
Heuchera richardsonii	Alum Root	1	April-July	green
Iris cristata	Crested Iris	1	April-May	purple, blue
**Monarda bradburiana*	Horsemint	2	May-June	pink
Mertensia virginica	Bluebells	2	March-June	pink, blue
**Phlox divaricata*	Wild Sweet William	1	April-June	purple, blue
Polygonatum biflorum	Solomon's Seal	3-6	May-June	white
Sanguinaria canadensis	Bloodroot	0.5-1	March-May	white
**Scutellaria incana*	Downy Skullcap	3-4	July-August	blue
**Silene caroliniana*	Wild Pink	1-1.5	April-May	rose, pink
Smilacina racemosa	False Solomon's Seal	2-3	May	white
**Solidago ulmifolia*	Elm-leaved Goldenrod	3-4	August	yellow
Spigelia marilandica	Pink Root	1	May-August	red/yellow
**Stylophorum diphyllum*	Celandine Poppy	1-1.5	April-June	yellow
**Tradescantia virginiana*	Spiderwort	1-1.5	May-July	purple, blue
Trillium spp.	Wake Robin	0.5-2	March-June	white, red
**Verbesina helianthoides*	Wingstem	3	June-July	lemon yellow
**Viola* spp.	Violet	0.5-1	April-June	white, blue, purple

Prairie Wildflowers

The essence of the prairie can be obtained by planting native prairie grasses and wildflowers. Since the prairie is essentially a grassland, a general rule of thumb is to establish an area with 50% native grasses, 50% wildflowers. In the home landscape, this translates to about two or three native grasses for every ten to twelve prairie wildflower species.

Medium-height grasses, such as little bluestem and sideoats grama grass, may be more appropriate in the home landscape than the tall grasses associated with our native prairies.

The prairie garden may be started from either transplants or from seed. The size of the area to be planted is the most important consideration when determining whether to use seed or transplants. In general, seeds are better for larger, naturalized plantings while transplants work well for smaller, landscaped plantings.

Garden soil need not be ammended as organically rich soil will cause prairie plants to grow too exuberantly. As a result, they may become weedy and need staking. Follow the plan outlined above in meadow and glade gardens for growing wildflowers from seed. Transplanting of bare-rooted seedlings should be done in early spring. Containerized plants can be planted at any time.

As a rule, prairie plants spend most of their first year establishing root systems, with little visible above ground growth. Hand pulling may be necessary to control noxious weeds during this vulnerable period. Your garden will begin to look more like a prairie during the second and third year of growth. During this time, an early-summer mowing (late June) will be helpful in controlling annual weeds. The homeowner should also follow-up with a fall mowing when the vegetation reaches a height between 6-10 inches. Spot applications of an herbicide may be applied, if necessary. When using an herbicide, follow the directions on the label.

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Your prairie planting should be fairly well established by the fourth year. At this point, maintenance tasks will be minimal and your prairie will pretty much take care of itself in the years to come.

Native Missouri Plants for the Prairie Garden

Botanical Name	Common Name	Height (in ft.)	Bloom Period	Bloom Color
Shrubs				
Amorpha canescens	Leadplant	1.5-3	May-August	blue/white
Ceanothus americanus	New Jersey Tea	3-4	May-September	white
Rosa setigera	Prairie Rose	6	May-July	white to pink
Rhus copallina	Dwarf Sumac	3	May-November	white
Grasses				
Andropogon gerardii	Big Bluestem	3-8	July-September	purple
Bouteloua curtipendula	Side-oats Grama	1-3	June-September	green, brown, purple
Elymus canadensis	Nodding Canada Wild Rye	2-4	June-September	green
Panicum virgatum	Switchgrass	3-5	July-September	varied
Schiwchyrium scoparium	Little Bluestem	2-4	July-September	purple
Sorghastrum nutans	Indian Grass	3-6	July-frost	tan-yellow
Sporobolits heterolepis	Prairie Dropseed	2-3	August-frost	tan-brown
Wildflowers				
Asclepias syriaca	Common Milkweed	8	July-August	pinkish
Asclepias tuberosa	Butterflyweed	1-2	June-August	orange, red
Aster linariifolius	Stiff-leaf Aster	0.5-1.5	August-frost	lavender
Aster novae-angliae	New England Aster	3.5-5	September-October	blue to purple
Baptisia leucantha	White False Indigo	3-6	June-July	white
Camassia scilloides	Prairie Hyacinth	1.5	April-May	purple
Castilleja coccinea	Indian Paint-brush	0.5-1.5	April-July	red
Coreopsis palmata	Prairie Tickseed	1-3	June-July	yellow
Dalea candidum	White Prairie Clover	1-3	July	white
Dalea purpurea	Purple Prairie Clover	1-3	July	purple
Echinacea pallida	Pale Purple Coneflower	2-3	June	purple, pink
Echinacea purpurea	Purple Coneflower	3	May-October	pink
Eryngium yuccifolium	Rattlesnake-master	3-4	July	greenish white
Eupatorium perfolialum	Boneset	3	July-October	white
Helianthus mollis	Ashy Sunflower	3-5	August	yellow
Helianthus occidentalis	Western Sunflower	2-3	July-August	yellow
Liatris aspera	Rough Blazing-star	4-6	September-October	purple
Liatris pycnostachya	Prairie Gayfeather	3-6	September-October	purple
Liatris spicata	Gay Feather	2-3	July-August	rose-purple
Monarda punctata	Dotted Monarda	2	June-October	purple/red
Parthenium integrifolium	American Feverfew	3	May-September	white
Penstemon digitalis	White Beardtongue	3-4	May-June	white
Phlox pilosa var. ozarkana	Prairie Phlox	1.5-3	May-June	pink
Ratibida pinnata	Gray-headed Coneflower	3-5	July-August	yellow
Rudbeckia hirta	Black-eyed Susan	3	June-September	yellow
Rudbeckia subtomentosa	Sweet Coneflower	6	August-September	yellow
Silphium laciniatum	Compass Plant	4-8	July-August	yellow
Silphium terebinthinaceum	Prairie Dock	3-6	July-September	yellow
Silphium integrifolium	Rosin Weed	4-6	July-August	yellow
Solidago speciosa	Showy Goldenrod	1-3	August-October	gold
Vernonia baldwinii	Ironweed	3	May-September	purple

Meadow and Glade Wildflowers

Meadow wildflowers prefer a dry, open, sunny spot with adequate drainage. Many meadow wildflowers are easily grown from direct seeding, but may need a period of stratification to assure germination. To stratify seeds, keep them under cool, dark moist conditions for a minimum period of three months or more depending on the species. This can be accomplished by putting seeds in a sealed bag with moist sand or perlite and placing it in the refrigerator. A fall sowing will allow nature to complete the stratification process for you.

Ideally, garden soil should be prepared two seasons before seeding and/or planting in order to gain control over weeds. If you are selecting a new location for your meadow wildflower garden, be certain to remove existing lawn grass and as many weeds as possible. This can be accomplished by digging, rototilling or by using an herbicide such as Roundup. When using any herbicide, be certain to carefully read the label before application.

When ready to plant, loosen the soil with a rake or a hoe. You can deliberately broadcast the seed for a naturalized look. After seeding, gently rake the seeds into the soil and cover lightly with straw. Keep the ground consistently moist for the next few weeks until the seedlings have an opportunity to become established.

If you plan to plant your meadow in the spring, purchasing container grown plants might be the best option. Purchasing plants is more costly, but they will become established more quickly. Plant according to the directions supplied by the nursery and keep well watered until established.

Many wildflowers that are associated with the meadow garden are actually glade species. Glades are naturally occurring open areas characterized by thin, rocky soils which produce an extremely hot, dry environment. Glade wildflowers will feel “at home” anywhere in a location that receives at least six hours of full sun each day. They are particularly tolerant of poor soils and drought conditions. As with meadow wildflowers, many glade wildflowers can be sown directly from seed.

Native Missouri Plants for Sunny Meadow and Glade Gardens

Botanical Name	Common Name	Height (in ft.)	Bloom Period	Bloom Color
Grasses				
Bouteloua curlipendula	Side-oats Grama	1 - 3	June-September	green, brown, purple

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Schizachyrium scopariwn	Little Bluestcm	2 - 4	July-September	purple
Sporobolus heterolepis	Prairie Dropseed	1 - 3	August-frost	tan-brown
Shrubs				
**Cornus asperifolia* var. *drummondii*	Rough-leaved Dogwood	4-5	May-June	white
**Rosa carolina*	Pasture Rose	3	May-June	pink
Wildflowers				
**Asclepias tuberosa*	Butterflyweed	1-2	June-August	orange, red
**Aster oblongifolius*	Aromatic Aster	3	September-October	blue
**Baptisia australis*	Blue Wild Indigo	2-3	May	blue
**Callirhoe involucrata*	Purple Poppy Mallow	0.5-1	June-July	rose pink
* *Coreopsis lanceolata*	Lance-leaved Coreopsis	1-2	May-August	yellow
**Echinacea pallida*	Pale-purple Coneflower	2-3	June	lavender
**Echinacea paradoxa*	Yellow Coneflower	2-3	June	yellow
Eryngium yuccifolium	Rattlesnake Master	3-4	July	greenish white
Heliopsis helianthoides	False Sunflower	4-6	May-September	yellow
**Liatris aspera*	Rough Blazing Star	4-6	September-October	purple
Liatris pycnostachya	Prairie Gayfeather	3-6	July-August	purple
**Monarda fistulosa*	Wild Bergamot	3-5	June-July	lavender
Oenothera speciosa	Showy Evening Primrose	0.5-1	May-July	white/pink
**0enothera macrocarpa*	Missouri Evening Primrose	0.5-1	June	yellow
**Penstemon cobaea* var. *purpureus*	Beard-tongue	2	April-May	rose purple
**Penstemon tubaeflorus*	Purple Beard-tongue	3-4	May-June	purple
Ratibida pinnata	Gray-headed Coneflower	3-5	July-August	yellow
Rudbeckia missouriensis	Missouri Black-eyed Susan	1-2	July	yellow
**Salvia awrea var. grandiflora*	Blue Sage	3	July-September	blue
Scutellaria incana	Downy Skullcap	1-1.5	June-September	blue
**Silene regia*	Royal Catchfly	1-1.5	May	pink
Solidago speciosa	Showy Goldenrod	3-4	August-October	yellow
Veronicastrurn viriginicum	Culver's Root	2-6	June-September	pink, white
**Verbena canadensis*	Rose Verbena	1.5-2	April-November	rose, purple
**Znia aurea*	Golden Alexander	1	July-September	yellow

Native Missouri Plants of the Moist Meadow Garden

Botanical Name	Common Name	Height (in ft.)	Bloom Period	Bloom Color
Sedges				
Carex grayi	Carex	1	May-October	beige
Carex stricta	Tussock Sedge	I - 1.5	May-July	beige
Shrubs				
Hamamelis vernalis	Vernal Witch Hazel	9	January-April	yellow
Physocarpus opulifolius	Ninebark	9	May-June	white
Sambucus canadensis	Common Elderberry	9	May-July	white
Wilflowers				
Asclepias incarnata	Swamp Milkweed	2-4	June-July	rose
Boltonia asteroides	Boltonia	4	July-October	purple
Chelone glabra	Turtlehead	2-3	July-September	white, pink
Eupatoriitin perfoliatum	Joe-pye Weed	3	July-September	pink
Eupalorium purpureum	Green Stemmed Joe-pye Weed	6	July-September	pink, p urplish
Helenium autumnale	Sneezeweed	6	August-November	yellow
Ins virginica	Southern Blue Flag	2	May-July	blue
Lilium michiganense	Michigan Lily	3	June-July	orange
Lobelia cardinalis	Cardinal Flower	3-4	July-October	red
Lobelia siphilitica	Blue Lobelia	3	August-October	blue, purple
Phlox maculata	Meadow Phlox	3	May-October	purple
Physostegia virginiana	Obedient Plant	3-4	May-September	pink, white
Rudbeckia fulgida	Brown-eyed Susan	I - 1.5	June-October	yellow

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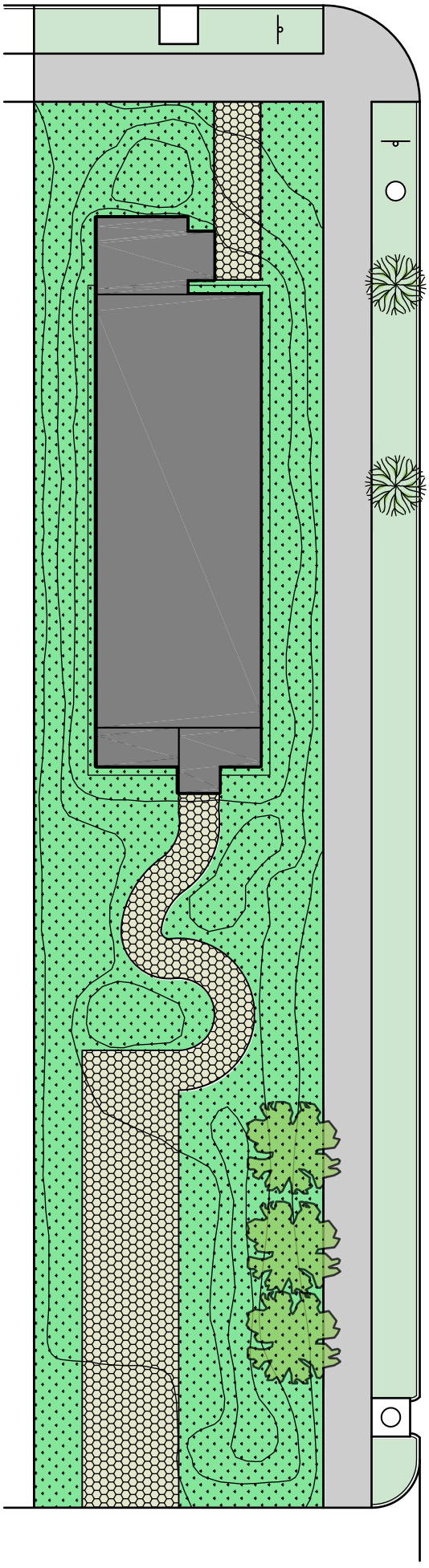

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Permeable paving

provided by: Professional Builder

One of the fastest growing approaches to green site development is permeable paving. There are a variety of options: block, stone, brick, permeable asphalt, permeable concrete and structural grids. All operate on the same principle: to allow rainwater to seep through a paved surface, which naturally cleanses pollutants and recharges aquifers instead of having the stormwater run onto other properties and into storm drains.

Because engineered curb and gutter storm drainage systems are costly to design and build, permeable pavement systems can often reduce overall construction costs for home builders.

I initially thought that permeable pavement was significantly more expensive and that the benefits wouldn't justify the cost. But after doing a little research and experimentation, I've been proven wrong. Permeable paving systems typically cost more than conventional pavement, but any additional paving cost is offset, at least in part, because there is less need for stormwater management infrastructure. Catch basins, stormwater ponds, curbs, gutters and storm drains can be eliminated or downsized. As a result, permeable paving has become a standard part of our company's repertoire.

As with so many green building features, doing the right thing for the environment also has some nice benefits for the builder and the homeowner.

Builders can benefit because:

- Minimizing storm water management issues simplifies planning
- Permeable paving puts money in the developer's pocket because there's no need to install costly water collection and detention areas
- Eliminating collection and detention areas increases the effective developable area, which also saves the developer money
- Builders can receive points on green certification programs

Benefits to the homeowner include:

- A safer surface that's easier to grip and is less likely to ice over
- Less chance of erosion and water seeping into basements
- A better appearance because permeable pavement eliminates the need for ugly surface runoff measures
- Lower maintenance costs because permeable surfaces require fewer repairs and need to be resurfaced less often
- More water to the root systems of plants and trees in the vicinity, resulting in healthier vegetation

The primary downsides of permeable paving are the higher initial cost of the paving itself and the need for regular cleaning to prevent clogging. A secondary consideration is that most permeable asphalts and concretes are not approved for heavy traffic loads.

Choosing a Surface

There are generally four options for permeable pavement: permeable pavers; permeable asphalt; permeable concrete; and permeable plastic or metal grids that hold grass or gravel in place.

- Permeable Pavers. For most residential applications, we tend to use pavers. These include block, brick, stone and other interlocking paving materials. Compared to conventional concrete and asphalt, they're less likely to crack over time, can be installed more quickly and are less expensive to repair if they do crack or move.

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- Permeable Asphalt. The same mixing and application equipment is used for porous bituminous (permeable) asphalt as for impervious asphalt; only the formula for the paving material changes. Another promising asphalt product is Firestone's Flexi-Pave, a permeable asphalt made largely from recycled tires. It retains the elasticity of rubber, which means it will be more shock absorbent, crack less, clog less and provide better grip than conventional asphalt.
- Permeable Concrete. This type of concrete requires larger pea gravel and a lower water-to-cement ratio, resulting in a pebbled, open surface that is roller compacted. Maintenance for both permeable concrete and permeable asphalt is generally the same - regular clearing of debris from the surface to prevent clogging of the "pores."
- Grids. The grid system achieves a more durable gravel or grass surface that allows water to pass through easily. The high-strength plastic grid provides a structural framework that holds gravel or grass in place and prevents compaction and erosion. As with all green features, making permeable pavement work requires educating the home buyer on the benefits and the importance of proper maintenance.

Installation is similar for permeable pavement as for conventional paving. First, crews excavate to the design depth of the pavement/gravel reservoir system. Then, the uncompacted base soil is covered with a geotextile fabric to reduce migration of soil fines into the gravel base. The permeable paving - be it pavers, asphalt, concrete or grid - is then placed. A word of caution: monitor the installer to ensure proper installation of the base rock, which can greatly affect the performance of the paving.

Rick Hunter is Managing Principal of Sage Homebuilders, a green builder in St. Louis. He writes on behalf of the Partnership for Advancing Technology in Housing (PATH), which is administered by the U.S. Department of Housing and Urban Development. Learn more about PATH at www.pathnet.org; learn more about Sage Homebuilders and green building at www.sagestl.com.

author: By Rick Hunter, For PATH Partners

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Read more about Permeable paving

Related Articles

A Green Home Begins with ENERGY STAR Blue

Homebuilders and homebuyers across the country are increasingly interested in green building. But what exactly makes a home green?

Green building means improving the way that homes and homebuilding sites use energy, water, and materials to reduce impacts on human health and the environment. Building a green home means making environmentally-preferable and sustainable decisions throughout the building process—decisions that will minimize the environmental impact of the home while it is being built and over the many years it will be lived in.

Did you know that a typical home can cause twice the greenhouse gas emissions of the typical car?

There are nearly 50 regional and national green home labeling programs around the country. While each program approaches green building a little differently, each incorporates important elements such as:

- Energy-efficient construction techniques and products.
- Improved indoor environments through environmentally-preferable materials and building practices.
- Water-efficient products and processes.
- Renewable energy options, when feasible.
- Waste reduction and recycling during the construction process.
- Smart growth and sustainable land development practices.

What should homebuyers look for first in a green home?

Energy efficiency is the place to start. That's because the energy used in homes often comes from the burning of fossil fuels at power plants, which contributes to smog, acid rain, and risks of global climate change. So, the less energy used, the less air pollution generated. And the easy way to make sure a new home is energy efficient is to look for the blue ENERGY STAR mark, the government-backed symbol for energy efficiency.

ENERGY STAR qualified homes are independently verified to meet strict guidelines for energy efficiency set by the U.S. Environmental Protection Agency. These homes save money on utility bills, provide a more comfortable living environment with better indoor air quality, and help protect the environment.

Typical features to look for in ENERGY STAR qualified homes include:

- **An Efficient Home Envelope**, with effective levels of wall, floor, and attic insulation properly installed, comprehensive air barrier details, and high-performance windows;
- **Efficient Air Distribution**, where ducts are installed with minimum air leakage and effectively insulated;
- **Efficient Equipment** for heating, cooling, and water heating;
- **Efficient Lighting**, including fixtures that earn the ENERGY STAR; and
- **Efficient Appliances**, including ENERGY STAR qualified dishwashers, refrigerators, and clothes washers.

Each **ENERGY STAR qualified home** can keep 4,500 lbs of greenhouse gases out of our air each year. And because homes have such long life-spans, this environmental benefit lasts for many, many years.

These energy efficiency improvements save homeowners money—about $200 to $400 per year on utility bills. More importantly, monthly energy savings can easily exceed any additional mortgage cost for the energy efficiency improvements, resulting in a positive cash-flow from the first day of home ownership. As a result, the cost-effectiveness of ENERGY STAR improvements can help offset additional costs associated with other green home features.

What comes after energy efficiency?

Homebuyers can also look for the ENERGY STAR Indoor Air Package label—a new specification developed by EPA to address the indoor environment component of green building. Homes that achieve this level of excellence are first qualified as ENERGY STAR, and then also incorporate more than 60 additional home design and construction features to control moisture, chemical exposure, radon, pests, ventilation, and filtration. Together, these features help protect qualified homes and their residents from mold, chemicals, combustion gases, and other airborne pollutants.

Completing the green home picture

Through ENERGY STAR qualified homes and the ENERGY STAR Indoor Air Package, homebuyers can address two critical green home elements. Then, look to the wide variety of available green home programs to complete the picture with water-efficient products, renewable energy technologies, waste reduction, recycling, and sustainable land development practices.

ENERGY STAR
INDOOR AIR PACKAGE
Specifications, version 2

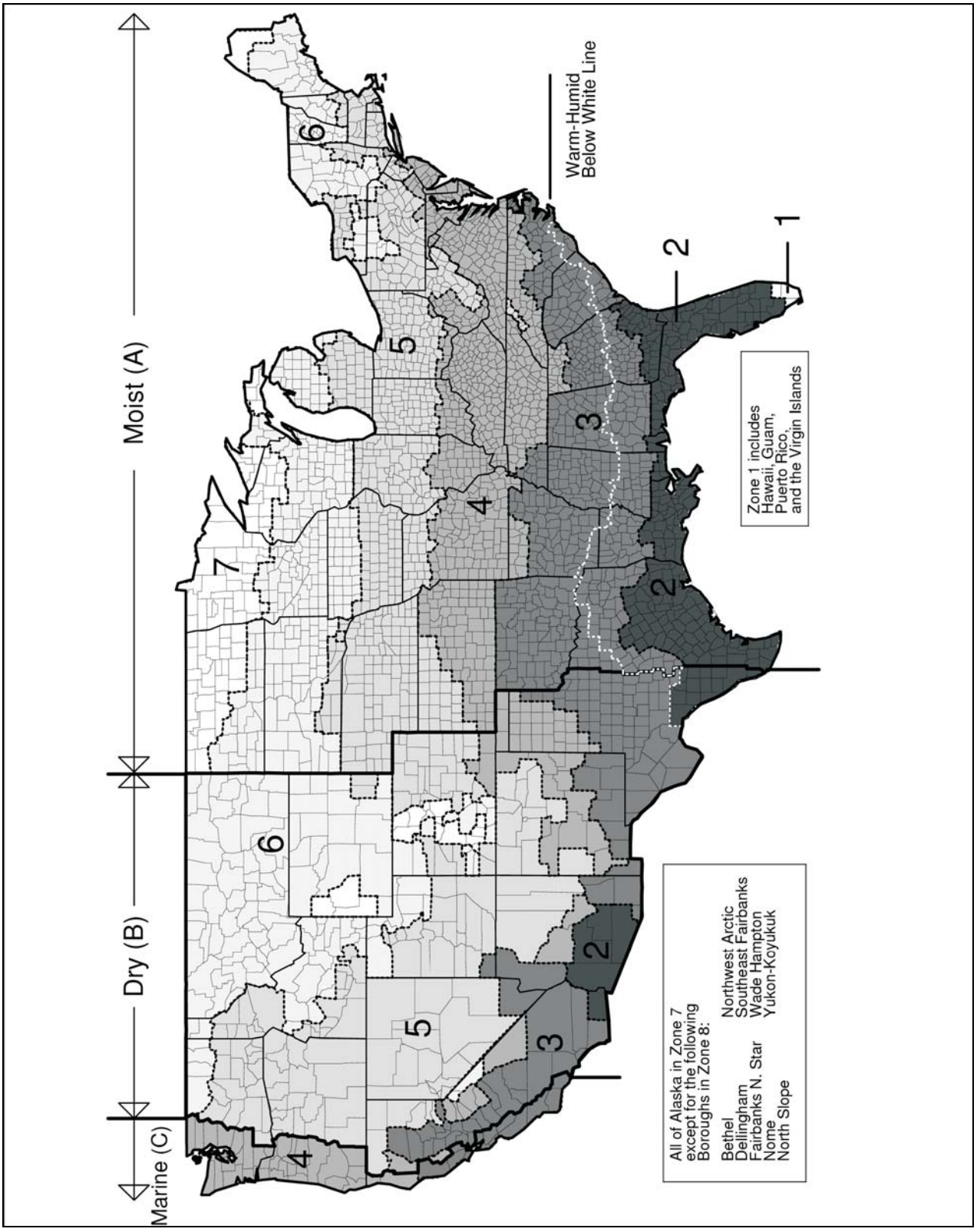
April 19, 2007

The following specifications have been developed by the U.S. Environmental Protection Agency (EPA) to recognize homes equipped with a comprehensive set of Indoor Air Quality (IAQ) features. Homes that comply with these specifications and are ***verified with a completed Indoor Air Package Verification Checklist*** (separate document) can use the "***Indoor Air Package***" as a complementary label to ENERGY STAR for homes. ***Only ENERGY STAR qualified homes are eligible for this label.***

These specifications were developed with significant input from external sources, based on best available science and information about risks associated with IAQ problems, and balanced with practical issues of cost, builder production process compatibility, and enforceability. EPA may change these specifications as more information becomes available.

The construction practices and technical specifications that comprise the ENERGY STAR Indoor Air Package are designed to contribute to improved IAQ in new homes compared with code-built homes. However, these measures alone will not guarantee that homebuyers will not experience IAQ problems in their homes. Rather, the Indoor Air Package should be viewed as a way to reduce the likelihood of experiencing such problems. For example, homeowner behavior may negatively impact the home's IAQ and the performance of the measures specified in the Indoor Air Package.

More program information, including Verification Checklist and brochures, available at:
www.energystar.gov/homes , then click the link for "Indoor Air Package"



1. Moisture Control	
Water Managed Foundations	
1.1	Surface water management shall be provided as follows: • Patio slabs, walks and driveway shall be sloped ¼ inch per foot away from house; AND • Final grade shall be back-fill tamped to accommodate settling and be sloped away from the foundation ½ inch per foot within the first 10 feet. Where setbacks limit space to less than 10 feet, provide swales or drains designed to carry water from foundation. Back-fill tamping is not required if proper drainage can be achieved using non-settling compact soils, as determined by a certified hydrologist, soil scientist, or engineer.
1.2	Install drain tile at footings below basement and crawlspace walls, level or sloped to discharge to outside grade (daylight) or to accessible sump pump. Top of drain tile pipe must always be below bottom of concrete slab or crawl space floor. Pipe shall be surrounded with min. 6 inches of ¾ inch washed or clean gravel that is fully wrapped with fabric cloth.
1.3	Capillary break shall be installed at all concrete slabs with either: • 4 inch bed of ½ inch diameter or greater clean aggregate, covered with minimum 6 mil polyethylene sheeting in direct contact with the concrete slab, lapped 6 to 12 inches at joints; OR • A minimum 4 inch uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting lapped 6 to 12 inches at joints. **Exceptions**: • In areas with free-draining soils, identified as Group 1 in the IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required. • Polyethylene sheeting not required in Dry climates as defined by IECC, Figure 301.1, unless required for radon resistance (2.1).
1.4	Exterior surface of below grade walls shall be finished as follows: • Poured concrete, concrete masonry and insulated concrete forms with damp proofing coating; AND • Wood framed walls with trowel-on mastic and polyethylene, or equivalent water proofing.
1.5	Sump pump covers shall be air sealed (e.g. mechanically attached with full gasket seal or equivalent.)
1.6	Crawl spaces shall be unvented and conditioned, as follows: • Crawl space floors shall be covered with a capillary break, using either: - Concrete slab over lapped polyethylene (i.e. a "rat slab"); OR. - 6 mil. polyethylene (10 mil. recommended) sheeting, lapped 6 to 12 inches and sealed or taped at seams. Sheeting shall be attached to walls and piers with adhesive and furring strips; AND • Crawl spaces shall be sealed to prevent outside air infiltration and be provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area; AND • In areas designated by local jurisdiction as flood zones, a sump pit and pump shall be installed in the crawlspace, with discharge point at least 10 ft. outside foundation. **Exceptions:** • Raised pier foundation with no walls. • Dry climates as defined by IECC, Figure 301.1 and Table 301.1. • Marine climates as defined by IECC, Figure 301.1 and Table 301.1, if no air handler or return ducts are installed in the crawlspace.
1.7	Do ***not*** install a continuous vapor barrier on interior or living space side of basement or crawlspace walls (semi-vapor permeable rigid insulation is not considered a vapor barrier).
Water Managed Wall Assemblies	
1.8	Install flashing or equivalent drainage system at the bottom of exterior walls to direct water away from drainage plane and foundation. Include weep holes for masonry veneer and weep screed for stucco cladding systems, per manufacturer specifications.
1.9	Install continuous drainage plane behind exterior wall cladding. Drainage plane material shall lap over flashing (1.8) and be fully sealed at all penetrations. Any of the following systems meet this requirement: • Monolithic weather resistant barrier (i.e. house wrap) sealed or taped at all overlap joints, top, and bottom; OR • Weather resistant sheathings (e.g. faced rigid insulation), fully taped at all "butt" joints; OR • Lapped shingle-style building paper or felts.

1. Moisture Control (continued)	
1.10	Prevent condensation problems (e.g. mold and rot) related to air leakage in exterior wall assemblies, by meeting all wall assembly requirements of the ENERGY STAR Thermal Bypass Checklist.
1.11	Fully flash all window and door openings, including pan flashing at sills, side flashing that extends over pan flashing and top flashing that extends over side flashing.
1.12 **Flex**	All deck ledger boards shall be attached to homes with either: • Minimum 3/8 inch spacers and full flashing shingle fashion from drainage plane to over framing; OR • Adhesive membrane strip taped to drainage plane running over ledger board and folded around joists over hanger with adhesive membrane cap patch over each joist. **Advisory:** If ledger is ACQ preservative-treated lumber, flashing material should be ACQ resistant to prevent corrosion.
Water Managed Roof Assemblies	
1.13	Prevent condensation problems (e.g. mold and ice dams) related to air leakage at attic/ceiling interfaces, by meeting all roof assembly requirements of the ENERGY STAR Thermal Bypass Checklist.
1.14	Install step flashing at all roof/wall intersections, with the exception of continuous flashing at metal and rubber membrane roofs. "Kick-out" flashing shall be installed at the low end of roof/wall intersections to direct water away from walls, windows, and doors below. In all cases, flashing shall extend at least 4 inches on the wall surface above the roof deck and shall be integrated with drainage plane above (shingle style) to direct water flow onto and not behind flashing. In addition, intersecting wall siding shall terminate a minimum of 1 inch above roof, or higher per manufacturer's recommendations.
1.15	Direct roof water from house with guttering and downspouts that empty to lateral piping that deposit water on sloping finish grade a minimum of 5 ft. from foundation. When lot space limits or prevents required grading, direct roof water to underground catchment system (not connected to foundation drain system) that deposits water 10 ft. from foundation. **Exception:** Dry climates as shown in IECC, Figure 301.1 and Table 301.1.
1.16 **Flex**	Install minimum No. 30 roof felt underlayment or equivalent.
1.17 **Flex**	Install metal drip edge or equivalent at roof decking edges. **Exception:** Dry climates as shown in IECC, Figure 301.1 and Table 301.1.
1.18	Install self-sealing bituminous membrane or equivalent at all valleys and roof decking penetrations for durability at failure points. **Exception:** Dry climates as shown in IECC, Figure 301.1 and Table 301.1.
1.19	In colder climates (IECC Climate Zones 5 and higher), install self-sealing bituminous membrane or equivalent ("ice flashing") over the sheathing at eaves for ice-dam protection. Ice flashing shall extend 2 feet inside the vertical plane of the exterior wall. **Exception:** Climate Zones 1-4, as shown in IECC, Figure 301.1 and Table 301.1.
Plumbing Systems	
1.20 **Flex**	Minimize risk of water leakage & material damage in areas with high risk for plumbing leaks, including: • Insulate piping installed in exterior walls, AND • Install water heaters near floor drain and/or provide catch pan, piped to home exterior, AND • Install moisture resistant backing material behind tub and shower enclosures (i.e. cement board or equivalent, not paper-faced).

2. Radon Control	
2.1	Homes built in U.S. EPA Zone 1 and Zone 2 Radon areas shall be constructed with approved Radon-resistant features (i.e. passive radon control), according to any of the following codes or standards: NFPA 5000, Chapter 49; IRC, Appendix F; CABO, Appendix F; or ASTM E1465. The following requirements shall be visually verified: • Capillary break installed according to 1.3 or 1.6; AND • Vertical vent pipe, clearly labeled "Radon Pipe" or "Radon System", 3"-4" in diameter, open at the bottom, extending from below the capillary break and terminating a minimum of 12" above the roof opening; for crawlspaces, perforated drain tile attached to the bottom of the radon vent pipe (beneath the sheeting) with a T-fitting and running horizontally, parallel to the long dimension of the house; AND • Electrical circuit installed in accessible location near the passive vent pipe, to facilitate fan installation if post-occupancy radon test reveals the need for an active system; AND • Foundation air sealing with polyurethane caulk or equivalent in all slab openings, penetrations, and control or expansion joints. **Exception:** Not required in U.S. EPA Zone 2 Radon areas if local radon potential is low, according to state or local jurisdiction, based on local indoor radon measurements (documentation required).
2.2	Provide owners of homes in U.S. EPA Zone 1 and Zone 2 radon areas two radon test kits designed for 48-hour exposures, including instructions for use and guidance for follow-up actions to testing results. **Advisory:** The U.S. Surgeon General and EPA recommend that all homes be tested for Radon (including homes built in Zone 3). Refer interested homebuyers to http://www.epa.gov/radon/ for more information.

3. Pest Barriers	
3.1	Minimize pathways for pest entry, by air sealing with blocking, foam, and polyurethane caulk or equivalent, including penetrations and joints in and between foundation and exterior wall assemblies. Completion of the ENERGY STAR Thermal Bypass Checklist meets this requirement.
3.2	Provide corrosion proof rodent/bird screens (e.g., copper or stainless steel mesh) for all building openings that cannot be fully sealed and caulked (e.g. ventilation system intake/exhaust outlets and attic vent openings), except clothes dryer vents.
3.3	In areas subject to "Heavy" termite infestation probability, provide the following: • Foundation walls shall be solid concrete or masonry with top course of solid block, bond beam, or concrete-filled block; AND • Construct all interior concrete slabs with 6" x 6" welded wire fabric or equivalent, and concrete walls with reinforcing rods to reduce cracking; AND • Sill plate shall be of preservative-treated wood. **Exception:** Areas with low risk of termite infestation: i.e. areas with no termite certification requirements or areas identified in IRC Figure R301.2(6) as "None to Slight" or "Slight to Moderate" probability areas.
3.4	In areas subject to "Very Heavy" termite infestation, the following additional requirements apply, Below grade: • Do not install foam plastic insulation on exterior face of below-grade foundation walls, or under slabs;AND Above-grade: • Foam plastic insulation installed on exterior of above-grade foundation walls shall be kept a minimum of 6 inches above the final grade and any landscaping bedding materials, and shall be covered with moisture resistant, pest-proof material (e.g., fiber cement board, galvanized insect screen at bottom-edge of openings); AND • Foam plastic insulation applied to the interior side of conditioned crawl space walls shall be kept a minimum of 3 inches below the sill plate and a minimum of 2 inches above the floor of the crawl space. **Exception:** This requirement only applies to areas identified in the IRC Figure 301.2(6) as "Very Heavy" probability of termite infestation, including AL, FL, GA, LA, MS, SC, and parts of CA and TX. All other areas are exempted.

4. HVAC Systems	
Heating and Cooling Equipment	
4.1	Heating & cooling design loads shall be determined for each room according to ACCA Man J, ASHRAE Handbooks, or equivalent software. Heating & cooling equipment shall be properly sized and selected to meet the design loads, including accommodation for pressure drop from specified filter (4.18). This requirement shall be verified by: • Documentation of design load calculations (i.e. load calculation worksheet or software report), AND • System design documentation (i.e. sizing calculations and equipment performance information), AND • Verification that outdoor and indoor coils match in accordance with ARI standards.
4.2	Air handling equipment shall not be located in garages.
4.3	No equipment is permitted that intentionally produces ozone (rather than as an incidental by-product).
4.4	Drain pans shall be sloped, corrosion resistant (e.g. stainless or plastic) with drains at the low point. Condensate lines shall be drained to drainage system; ***not*** just deposited under slab.
4.5	In "Warm-Humid" climates as defined by IECC Figure 301.1 (i.e. climates with prolonged periods of sustained warm-humid weather), equipment shall be installed with sufficient latent capacity to maintain Relative Humidity (RH) at or below 60%. This requirement shall be met by either of the following: • Additional dehumidification system(s), OR • Central HVAC system equipped with additional controls to operate in dehumidification mode. **Exception:** Not required in Climate Zones 2B, 3B, 3C, 3A above the white line, and 4-8, as shown by IECC Figure 301.1. **Advisory:** Also recommended in Climate Zones 3A and 4A as shown by IECC Figure 301.1.
4.6 **Flex**	Seams in the HVAC cabinet, plenum, and adjacent duct work shall be sealed with either or a combination of mastic systems or tape that meet the applicable requirements of UL 181A or UL 181B; and/or gasketing systems. **Performance Alternative:** Total system leakage meeting requirements of 4.13.
4.7	HVAC and duct systems shall be protected from dust/debris during construction activities: • If HVAC equipment is not used during construction, supply and return duct boots shall be covered with "duct mask" or similar sheeting to keep ductwork clean, OR • If HVAC equipment is used during construction, properly fitting filter (see 4.18 & 4.19) must be installed during operation.
4.8 **Flex**	During final preparation (prior to 7.3), remove all supply and return duct registers/grilles and vacuum accessible ductwork.
Ductwork	
4.9	Duct system(s) shall be designed and installed according to ACCA Man D, ASHRAE Handbooks, or equivalent software. This requirement shall be verified by appropriate documentation (i.e. duct sizing worksheet or annotated layout). **Performance Alternative:** Room-by-room airflows balanced and verified within +/-20% of calculated room airflows to meet design loads (see 4.1), except for baths, closets, and pantries.
4.10	Ductwork shall not be installed in garage.
4.11	Building cavities shall not be used as part of the forced air supply or return system.
4.12	Ductwork shall be sealed with either or combination of: • Mastic systems that meet the applicable requirements of UL 181A, or UL 181B, OR • Aerosol sealant closures meeting UL 723, OR • Gasketing systems.
4.13	Duct system leakage shall be measured at 25 Pascals, with duct boots and air handler in place, according to ASTM E1554, ASHRAE 152, or other RESNET approved method, to either of the following specifications: • Total system leakage no greater than 6 CFM per 100 s.f. floor area (or 9% design fan flow), OR • Duct leakage to outdoors meeting ENERGY STAR requirements (i.e. 6 CFM per 100 s.f. for the Performance Path, or 4 CFM per 100 s.f. for the National BOP Path).

4. HVAC Systems (continued)	
4.14	Transfer grilles or jump ducts shall be provided for any closed room without a dedicated return, except for baths, kitchens, closets, pantries, and laundry rooms. Opening size shall be 1 square inch capacity (grille area) per CFM of supply (including free area undercut below door as part of the area). **Performance Alternative:** Measured pressure differential no greater than 2.5 Pa (0.01" w.c.) between closed rooms and adjacent spaces with return.
Ventilation	
4.15	Provide mechanical whole-house ventilation meeting all ASHRAE 62.2 requirements. The following requirements shall be visually verified: • Whole house mechanical ventilation system & controls installed to deliver prescribed outdoor air ventilation rate (62.2 section 4), including ventilation restriction in 62.2 section 4.5 (i.e. max 7.5 cfm/100 sq.ft.) for "Warm-Humid" climates as defined by IECC Figure 301.1; AND • Transfer air (i.e. air from adjacent dwelling units or other spaces such as garages, crawlspaces, or attics) shall not be used to meet ventilation requirements (62.2 section 6.1); AND • Air inlets shall be located a minimum of 10 ft. from contaminant sources (62.2 section 6.8), AND • Airflow tested to meet rated fan airflow (at 0.25 in. w.c.), or duct(s) sized per requirements of 62.2 Table 7.1 and/or manufacturer's design criteria (62.2 section 7.3). **Notes:** • Outdoor air ducts connected to the return side of an air handler shall be permitted as supply ventilation only if manufacturers' requirements for return air temperature are met (e.g., "air shall be tempered to maintain minimum 60 degree F continuous air flow across furnace heat exchanger"), • The ventilation restriction for "Warm-Humid" climates is not applicable when Energy Recovery Ventilators (ERV's) or whole-house dehumidification are installed, per manufacturer's instructions.
4.16	Provide local mechanical exhaust ventilation to outdoors in each bathroom and kitchen, meeting ASHRAE 62.2 section 5 requirements. In addition, all bathroom ventilation fans shall be ENERGY STAR qualified unless multiple bathrooms exhausted with a multi-port fan.
4.17	Clothes dryers shall be vented to outdoors. **Exception:** Electric condensing dryers, equipped with condensate drain.
Air Filtration	
4.18	HVAC filters shall be rated MERV 8 or higher at 295 feet per minute according to ASHRAE 52.2.
4.19	There shall be no visible bypass between the filter, the filter rack, and the plenum/blower housing. In addition, the filter rack shall be designed to ensure the filter is in complete contact with the rack as follows: • The filter rack shall be fitted with flexible, air-tight (e.g. closed cell foam) gasketing on the surface that contacts the air-leaving (downstream) side of the filter, or equivalent method; AND • The filter shall be held firmly in place by friction fit, spring clips in the filter rack (installed on the upstream side of the filter), or equivalent method. **Note:** Manufacturer filter media boxes designed to accomplish these purposes meet these requirements.
4.20	If central vacuum system is installed, system shall be vented outdoors at least 10 ft. from ventilation system air inlets (see 4.15), or power/filtration unit installed in garage per manufacturer instructions.

5. Combustion Systems & Garage Isolation	
Combustion Appliances	
5.1	Combustion fueled heating equipment ***located in conditioned spaces:*** • Gas-fired furnaces/boilers shall be direct vented, • Oil-fired furnaces/boilers shall be power vented or direct vented. **Exception:** Climate Zones 1-3, as shown in IECC, Figure 301.1 and Table 301.1. **Note:** Unfinished basements and crawlspaces (except raised pier foundation with no walls) are considered "conditioned spaces" for the purpose of this requirement and 5.2 below.
5.2	Combustion fueled water heaters ***located in conditioned spaces*** shall be direct vented or power vented. **Note:** See note 5.1 above regarding conditioned spaces. This requirement also applies to water heaters installed in attached garages that are air-sealed to the outside for intended use as work space or living space.
5.3	Fireplaces and Fuel Burning Appliances located in conditioned spaces shall meet the following efficiency or emissions standards and restrictions: • **Masonry fireplaces** are not permitted, with the exception of masonry heaters, as defined by ASTM E1602, and the IBC, 2112.1. • **Factory-built, wood-burning fireplaces** shall meet the certification requirements of UL 127, and meet the emission limits in EPA 40 CFR Part 60. • **Natural gas and propane fireplaces** shall be power vented or direct-vented, as defined by NFPA 54, 3.3.108, have a permanently fixed glass front or gasketed door, and comply with ANSI Z21.88/CSA 2.33. • **Wood stove and fireplace inserts** as defined in Section 3.8 of UL 1482, shall meet the certification requirements of that standard, and shall meet emission requirements of EPA 40 CFR Part 60 and WAC 173-433-100 (3). • **Pellet stoves** shall meet the requirements of the ASTM E1509. • **Decorative gas logs** as defined in K.1.11 of NFPA 54 (National Fuel Gas Code) are not permitted. • **Un-vented combustion appliances** are not permitted, with the exception of kitchen-type cooking devices with exhaust ventilation meeting ASHRAE 62.2 section 5.
5.4	Fireplaces and Fuel Burning Appliances located in conditioned spaces shall meet the following additional design and installation requirements: • Vented to the outdoors; AND • Adequate combustion and ventilation air shall be provided, minimizing the potential for spillage or "back-drafting", either by complying with ASHRAE 62.2 section 6.4 or equivalent design requirements, or by conducting a Worst Case Depressurization Combustion Air Zone (CAZ) Test according to an established protocol.
Garage Isolation	
5.5	Common walls and ceiling between an attached garage and living space shall be visually inspected to be air-sealed before insulation is installed.
5.6	All connecting doors between living space and garage shall include an automatic closer, and shall be gasketed or made substantially air-tight with weather stripping.
5.7	Attached garages shall include a 100 cfm ducted or 80 cfm unducted exhaust fan, venting to outdoors and designed for continuous operation. Alternatively, automatic fan controls may be installed that activate the fan whenever garage is occupied, and for at least 1 hour after garage is vacated. **Advisory:** ENERGY STAR qualified fans are highly recommended.
Carbon Monoxide Alarms	
5.8	All homes with combustion appliance(s) or attached garage shall have one carbon monoxide (CO) alarm installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. They shall be placed according to NFPA 720, and be hard-wired with a battery back-up function. The alarm devices shall be certified by either CSA 6.19-01 or UL 2034.

6. Building Materials	
Preparation and Installation	
6.1	Building materials with visible signs of water damage or mold shall not be installed. In addition, interior walls shall not be enclosed (e.g. with drywall) if either the framing members or insulation products have a high moisture content. For wet-applied insulation products, follow manufacturer's drying recommendations. **Advisory:** Lumber should not exceed 18% moisture content.
6.2	Raise paper covered gypsum board ½ inch above concrete slabs.
Materials	
6.3	Structural plywood conforming to PS1 and PS2 and oriented strand board shall be made with exterior-type adhesives. Exterior-type adhesive is evidence by the appearance of "Exposure 1" or "Exterior" in the panel trademark.
6.4	Particleboard and medium density fiberboard (MDF) shall be certified compliant with ANSI A208.1 and A208.2, respectively.
6.5	Hardwood plywood shall be compliant with ANSI/HPVA HP-1-2004 and U.S. HUD Title 24, Part 3280.
6.6	Wall-to-wall carpet shall not be installed adjacent to toilets and bathing fixtures (i.e. tubs and showers).
6.7 **Flex**	Install water-resistant hard-surface flooring in kitchens, entryways, laundry areas, and utility rooms.
6.8	Permeability rating of finishes used on the interior side of a home's exterior walls in hot humid or humid mixed climates shall be greater than '1'.
6.9	Carpets, carpet cushion (i.e. padding), and carpet adhesives shall be labeled with the Carpet & Rug Institute (CRI) Green Label or documented to meet the CRI Green Label testing program criteria. Products labeled with the CRI Green Label Plus also meet this requirement.

7. Home Commissioning	
Final Preparation & Verification	
7.1	Inspect ductwork before installing registers, grilles, and diffusers, to verify it is dry and substantially free of dust/debris, and that there are no disconnects or large air gaps between boots and framed openings.
7.2	Inspect air-handling equipment and verify: • Heat exchangers/coils are free of dust created by construction activities (e.g., drywall, floor sanding); AND • Filter is new and clean, and matches specified MERV rating (4.18).
7.3	After installation of registers, grilles, and diffusers, verify airflows as follows: • Measured airflow or pressure drop across the cooling coil and/or heat exchanger documented to be within +/- 15% of system design airflow, or manufacturer specified operating range, tested according to ASTM E1554, ASHRAE 152, or equivalent method, AND • Detectable airflow from each supply outlet.
7.4	Verify HVAC contractor has documented installation and testing of proper refrigerant charge. This requirement may be met by any of the following: • Superheat method test measurement within 5% of manufacturer recommended charge, OR • Sub cooling method test measurement within 3% of manufacturer recommended charge, OR • Other equivalent method/tolerance approved by equipment manufacturer. **Note:** If weather conditions do not meet required test conditions, verify builder has arranged for future test.
7.5	Verify home has been ventilated with outside air at the highest rate the ventilation system can produce, *if practical*, during and shortly after installing products that are known sources of contaminants (e.g. cabinets, carpet padding, and painting), and during the period between finishing and occupancy, meeting ventilation requirements for outdoor air flow and humidity control (4.15). If whole house ventilation is impractical prior to occupancy, advise home buyer to do so during the first few months of occupancy.
Owner's Checklist/Manual	
7.6	Provide home buyer with a checklist listing all required measures from this specification along with the signature of official representative of builder indicating full compliance with the checklist.
7.7 **Flex**	Provide home owner's manual including at a minimum documentation on all special equipment with instructions for proper operation and maintenance, and HVAC load calculations.

CHANGE FOR THE BETTER WITH ENERGY STAR

B-EQ1

U.S. Environmental Protection Agency

New Homes with the ENERGY STAR® Indoor Air Package

EPA 430-E-05-002 October 2005

WHAT IS
ENERGY STAR?

ENERGY STAR is the government-backed symbol for energy efficiency, helping businesses and individuals protect the environment through superior energy efficiency. It identifies new homes, buildings, and more than 40 types of products that are energy efficient and offer the features, quality, and performance today's consumers expect. Products earning the ENERGY STAR label include appliances, lighting, vent fans, home office equipment, consumer electronics, and heating and cooling equipment.

The ENERGY STAR label on a new home means that it is independently verified to be at least 15% more efficient than homes built to the 2003 International Energy Conservation Code. By purchasing an ENERGY STAR qualified home, you can have all the features you desire in your new home, plus lower utility bills. And you will help prevent greenhouse gas emissions. Ask your builder for a brochure about the features built into every ENERGY STAR qualified home.

WHY DOES INDOOR AIR QUALITY MATTER?

People are increasingly concerned about mold, radon, carbon monoxide, and toxic chemicals commonly found in homes. In fact, U.S. Environmental Protection Agency (EPA) studies show that levels of air pollution inside the home are often two to five times higher than outdoor levels. And poor indoor air quality is associated with a host of health problems, including eye irritation, headaches, allergies, and respiratory problems such as asthma.

HOW CAN BUILDING PRACTICES HELP IMPROVE INDOOR AIR QUALITY?

Builders can employ a variety of construction practices and technologies to decrease the risk of poor indoor air quality, including careful selection and installation of moisture control systems, heating, cooling, and ventilation (HVAC) equipment, combustion venting systems, and building materials. But it's not easy for homebuyers to keep track of all the preferred construction details that lead to improved indoor air quality and energy efficiency. That's why EPA created the ENERGY STAR Indoor Air Package.

Homes that earn the ENERGY STAR Indoor Air Package label are designed to have lower utility costs, greater comfort, better durability, and reduced risk of indoor air problems.*

ENERGY STAR
INDOOR AIR PACKAGE

Homes with the ENERGY STAR Indoor Air Package are at least 15% more energy efficient than homes built to the 2003 International Energy Conservation Code (IECC) and are designed to have improved indoor air quality compared to code-built homes.

HOW DO HOMES EARN THE LABEL FOR THE ENERGY STAR INDOOR AIR PACKAGE?

START WITH ENERGY STAR

A home must first be designed and built to earn the ENERGY STAR—the government-backed symbol for energy efficiency. The result is a home that is significantly more energy efficient than a code-built home.

ADD INDOOR AIR IMPROVEMENTS

More than 70 additional home design and construction features are included in the Indoor Air Package to help protect qualified homes from moisture and mold, pests, combustion gases, and other airborne pollutants.

COMPLETE THE PACKAGE WITH INDEPENDENT TESTING AND VERIFICATION

The home's energy performance and many key features of the Indoor Air Package are inspected by an independent third-party to ensure that the builder has properly followed EPA's rigorous guidelines for energy efficiency and specifications for indoor air quality.

* *The construction practices and technical specifications that comprise the ENERGY STAR Indoor Air Package are designed to contribute to improved indoor air quality in new homes compared to code-built homes. However, these measures alone will not guarantee that homebuyers will not experience air quality problems in their homes. Rather, the Indoor Air Package should be viewed as a way to reduce the likelihood of experiencing such problems. For example, factors such as unforeseen construction issues and homeowner behavior may negatively impact the home's indoor air quality and the performance of the measures specified in the ENERGY STAR Indoor Air Package.*

WHAT FEATURES ARE INCLUDED IN NEW HOMES WITH THE ENERGY STAR INDOOR AIR PACKAGE?

MOISTURE CONTROL: Moisture problems can lead to mold and other biological pollutants that can negatively impact health. With the Indoor Air Package, builders use a variety of moisture control features designed to minimize these risks, including improved control of condensation and better roof, wall, and foundation drainage.

HEATING, VENTILATION, AND COOLING (HVAC) SYSTEM: Poorly designed and installed HVAC systems can lead to comfort and air quality problems. Homes with the Indoor Air Package include properly engineered system sizing, improved duct and equipment installation, improved filtration, and whole-house and spot ventilation to dilute and remove indoor pollutants. Builders also inspect air-handling equipment and ductwork to ensure they are clean and free of debris and provide adequate air-flow.

PEST MANAGEMENT: Residue from pests, such as rodents, dust mites, and cockroaches, is known to trigger allergy and asthma episodes. In addition, wood-eating pests, such as termites, can quickly destroy a homeowner's most valuable investment. With the Indoor Air Package, builders provide a first-line defense against these problems by fully sealing, caulking, or screening possible pest entry points and using termite shields in areas of the country subject to termite infestation.

COMBUSTION-VENTING SYSTEMS: In homes with the Indoor Air Package, builders can help protect residents from potential exposure to combustion pollutants by using fossil-fuel heating equipment that cannot spill combustion gases inside the home, installing carbon monoxide alarms in each sleeping area, and taking steps to prevent pollutants in the garage from entering the house.

BUILDING MATERIALS: The types of materials builders choose and the way they manage them during construction can affect a home's indoor air quality. Builders following the Indoor Air Package specifications reduce sources of pollutants by protecting materials stored on-site from weather damage, using materials with reduced chemical content, and ventilating homes prior to move-in to help improve indoor air quality.

RADON CONTROL: Exposure to radon, a naturally occurring radioactive, invisible, and odorless gas, is the second leading cause of lung cancer in the United States. In high-risk radon areas, homes with the Indoor Air Package are built with radon-resistant construction techniques. Homebuyers in these areas are also provided with test kits to check radon levels after they move in.

HOMEOWNER EDUCATION: After purchasing a home with the ENERGY STAR Indoor Air Package, owners receive a manual explaining their home's indoor air quality features and showing how to operate their home to continue minimizing the risk of indoor air quality problems.

For more information, visit www.energystar.gov/homes

Location and Linkages

LL2- Site Selection (2 points)

Building is not being developed on land with elevation below the 100-year floodplain. Nor is it being developed on land that is indentified as habitat for any species on federal endangered list. The site contains land that is not public parkland, nor does it contain any “prime” or “unique” soils identified by the Natural Resources Conservation Service soil surveys.

LL3.2- Preferred Locations – Infill (2 points)

At least 75% of the development site immediately borders previously developed land.

LL4- Existing Infrastructure (1 point)

Selected lots of development are within ½ mile of existing water service lines and sewer service lines.

LL5.2- Extensive Community Resources/ Transit (2 points)

The development site is located within ½ mile of 11 basic community resources, such as arts/ entertainment center, bank, community or civic center, library, dry cleaner, restaurant, school, supermarket, place of worship, office building, etc. (See Amenities Map)

LL6- Access to Open Space

Location of development is within ½ mile of publicly accessible or community-based open space that is at least ¾ acre in size. (See Amenities Map)

APPENDIX B-EA

LEED for Homes - Jan 2008
Energy & Atmosphere Category

Point Feasibility Assessment

When approaching this LEED category it is important to recognize the opportunity of taking one of two different paths. The first option (called the *Performance Approach*) is to comply with the requirements of ENERGY STAR for Homes, while the second option (referred to as the *Prescriptive Approach*) breaks up the Energy Star requirements into separate points. For this project in University City we would like to suggest that the second path be taken because it allows for more flexibility in choosing which points to achieve. However, if the budget allows for a full Energy Star third-party inspection, that may be a simpler route to take. Many of the credits in the second option actually overlap with Energy Star requirements anyway, so it seems that would be the ideal way to go.

ENERGY STAR is the government-backed symbol for energy efficiency. It identifies new homes, buildings, and more then 50 types of products that are energy efficient and offer the features, quality, and performance that are expected and relevant today. Products included in the Energy Star rating include windows, heating and cooling equipment, lighting, and appliances. These products tend to be slightly more expensive than generic products, but their longevity, reliability and efficiency offset that price difference in the long run.

The following is a brief description of both the Performance and Prescriptive Approach to the Energy & Atmosphere (EA) category of the LEED rating system. Note that points cannot be earned in both of these sections.

Performance Approach:

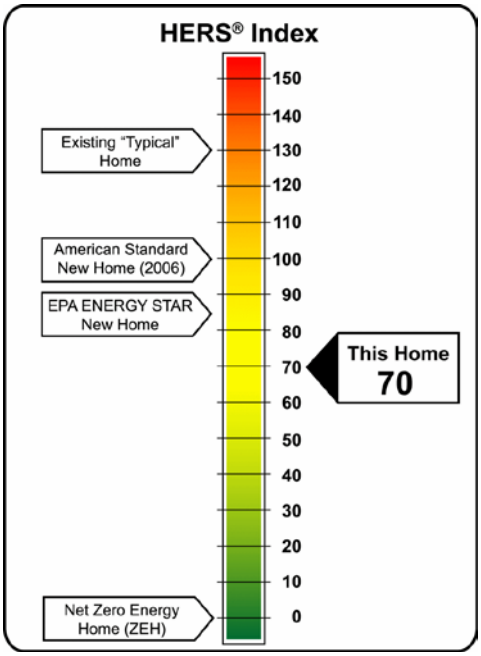
EA 1:
Optimize Energy Performance
Max Points: 34

Synopsis: NOT LIKELY (0 points)

Description:

This credit involves meeting the performance requirements of ENERGY STAR for Homes as a prerequisite and then exceeding those standards to earn LEED points. An equation has been developed to help convert the Home Energy Standards (HERS) Index to the appropriate number of LEED points. Since St. Louis is located within Zone 4 of the IECC Climate Zones (see attached map, **APPENDIX B-EA1.1**), this means the correct equation to use would be:
LEED Pts = {[Log(100-HERS Index)]/0.021}-60.8

To receive the maximum number of points (34) for this category, the designed home would have to exceed the Energy Star standards by 100%. When looking at the following graphic it becomes clear that this would mean the home would have to be designed as a zero-energy building, or ZEB.



While the term "zero-energy building" has many definitions, it is most often defined as a building that produces as much energy on-site as it consumes on an annual basis. They are actually referred to as net-zero energy buildings because they do use energy; however, the supply from on-site generation is equal to (or greater than) the facility's demand.

Since we are not suggesting this home be designed with many energy producing features (such as solar panels), but are rather focusing on energy saving features, it seems unlikely that the building would ever receive anything near the total 34 points. Of course we are not prohibiting the home from being tested by an Energy Star rater. This would be perfectly acceptable.

However, it would be difficult to discern the exact amount of LEED points earned until after the building has been completely constructed and tested. Therefore, we recommend using the *Prescriptive Approach* to completing the EA category, as will be further explained in the following pages.

Jay Swoboda, founder of EcoUrban Homes (http://www.ecourbanhomes.com/), has furnished us with a copy of the Expanded Project Checklist (see **APPENDIX B-EA1.2**) for one of the LEED Platinum homes he developed that is of a similar size (3 Bedrooms at 1277sqft). For this project he pursued the prescriptive route, although it seems that he also did have the home Energy Star rated and received a HERS Index Value of 74 for the home. Since we are planning on including many of the same features, it is safe to assume that a similar value might be met by the homes designed for University City. This being the case, the total points earned for the section could amount to about 10 (according to the comparison chart provided in the LEED manual, Table 15 on page 56).

Prescriptive Approach:

EA 2:
Insulation
Max Points: 2

Synopsis: HIGHLY LIKELY (2 points)

Description:

Insulation materials are rated according to their ability to resist heat flow. This thermal resistance rating is commonly known as an "R-value". The higher the R-value of a material, the better its ability to resist heat flow.
To achieve the two points possible from this credit we are proposing the use of Icynene foam insulation within the home. Icynene foam is a type of insulation that can be sprayed into the necessary spaces. Typically the R-value per inch Thickness for Spray-type insulation ranges from 3.5 to 6.0, one of the best performing insulation types. (See **APPENDIX B-EA2.1**). This type of insulation can help achieve the prerequisite for this credit by significantly lowering air leakage of the building envelope and can also help achieve a reduction of up to 50% in energy consumption to gain the maximum 2 points.

More information on this type of insulation can be found in the Appendix (**B-EA2.2**) or by visiting the website: http://www.icynene.com/.

EA 3:
Air Infiltration
Max Points: 3

Synopsis: LIKELY (3 points)

Description:

To gain points in this section the building must be tested by an energy rater (Appendix) to see how much air is "leaking" through and at what rate. The standards for Home Energy Ratings, inspection protocols, and testing guidelines are maintained by the Residential Energy Services Network (RESNET). For more information, visit the RESNET Web site at www.resnet.us. Since there are other points that can possibly be earned by having an energy rater test the house (such as EA 5: Heating and Cooling Distribution System), it would make sense to have the air infiltration tested as well. By using the Icynene foam insulation we are fairly certain that 3 points could be earned for this section. Certainly 2 points would at least be possible. Since St. Louis is in IECC Climate Zone 4, this would mean having an air leakage rate of 4.25 as seen on Table 17 on page 61 of the LEED Manual.

EA 4:
Windows
Max Points: 3

Synopsis: HIGHLY LIKELY (3 points)

Description:

Installing exceptional windows in each of the University City homes is of utmost importance. To receive 3 points for this credit the windows must have NFRC ratings that substantially exceed the window requirements of ENERGY STAR. The National Fenestration Rating Council (NFRC) is a nonpartisan coalition of professionals whose purpose is to provide fair, accurate and credible energy performance ratings for fenestration products. Our windows would have to meet a U-factor of ≤0.32 and an SHGC of ≤0.40. U-factor defines the amount of heat loss through the total unit, where the lower the value, the less heat is lost through the entire product. Solar Heat Gain Coefficient (SHGC) defines the fraction of solar radiation admitted through the glass both directly transmitted and absorbed and subsequently released inward. Again, as with the U-factor, the lower the value means less heat is transmitted through the product.

In doing some research on window types, it was discovered that there are numerous window options that meet the above U-factor and SHGC criteria. (See **APPENDIX B-EA4.2** on Andersen Windows). We would also like to stress that all windows be operable, with larger windows facing towards the south to allow for maximum natural day-lighting.

EA 5:
Duct Tightness
Max Points: 3

Synopsis: LESS LIKELY (3 points)

Description:

This credit is another one that requires the verification of an energy rater. We are assuming that the prerequisites could be met, which include limiting air duct leakage by using at least R-6 insulation around ducts in unconditioned spaces and also not installing ducts in exterior walls. However, we are not certain that we would pursue the additional credits for this section, although we did set aside a centrally located chase for the ventilation equipment within the plan.

EA 6:
Space Heating and Cooling
Max Points: 4

Synopsis: LIKELY (2 points)

Description:

This credit requires the installation of a high-efficiency HVAC system. Based on the points achieved by Jay Swoboda of EcoUrban Homes, it should be possible to earn at least 2 points for this credit.

Another consideration would be to install a Geothermal Heat Pump in the home. This would certainly be a unique amenity to the house, since geothermal heating is more reliable and comfortable than traditional heating technology. It is also not very difficult to install, especially if a couple lots are being developed together at the same time. The necessary piping can simply be laid under the foundations of all the homes before construction begins. There is a local company in St. Louis called Hydro Heat that installs this type of heat pump. For more information and a cost comparison with a traditional system, please see the appendix (**B-EA6.1**) or visit their website at:
http://www.hydroheat.com/residential.htm.

EA 7:
Domestic Hot Water
Max Points: 6

Synopsis: HIGHLY LIKELY (2 points)
POSSIBLE (3 points)

Description:

There are no prerequisites for this credit. The requirement is to install an energy-efficient hot water distribution system which can be done in a number of ways. For the design of the homes in University City we have chosen to implement a "compact design of a conventional system." This means that "No branch line from the water heater to any fixtures may exceed 20 feet in one-storey homes. Add 1x the ceiling height for two-story homes…" Since the homes we designed have a floor to ceiling height of 9 feet, this means no branch line may exceed 29 feet. Considering the entire footprint of the homes are only 16x44 feet, this should be easily accomplished.
Additionally, 3 more points can be earned by really focusing on a compact design with a tight plumbing core. This is essentially what we have tried to accomplish, with a central plumbing core located within the back portion of the home, serving the kitchen area, laundry facilities and bathrooms on all floors.

EA 8:
Lighting
Max Points: 3

Synopsis: HIGHLY LIKELY (3 points)

Description:

Since the designed homes are relatively small and will not require a vast amount of lighting, we feel it is completely possible to install the ENERGY STAR Advanced Lighting Package using only ENERGY STAR labeled fixtures. The Advanced Lighting Package consists of a minimum of 60% ENERGY STAR qualified hard-wired fixtures.

EA 9:
Appliances
Max Points: 3

Synopsis: HIGHLY LIKELY (2 points)

Description:

By installing an ENERGY STAR refrigerator, dishwasher, and clothes washer a total of 2 LEED points can be earned for this credit. Additional points could be earned if ceiling fans were installed as well. ENERGY STAR qualified appliances incorporate advanced technologies and use 10 to 50 percent less energy than standard appliances.

EA 10:
Renewable Energy
Max Points: 10

Synopsis: NOT LIKELY(0 points, unless the option of Geothermal Heating is pursued)

Description:

If a renewable electricity generation system is installed in the home it is possible to receive 1 point for every 3% of the annual reference electrical load met by the system. We are not considering solar panels or miniature wind turbines as forms of electrical generation because they do not currently fit within the budget. However, there is the financial possibility (utilizing tax credits) that a geothermal heat pump may actually be feasible. For information on a local company that provides geothermal heating look at Hydro Heat, available on the web at: http://www.hydrodelta.com/residential.htm.

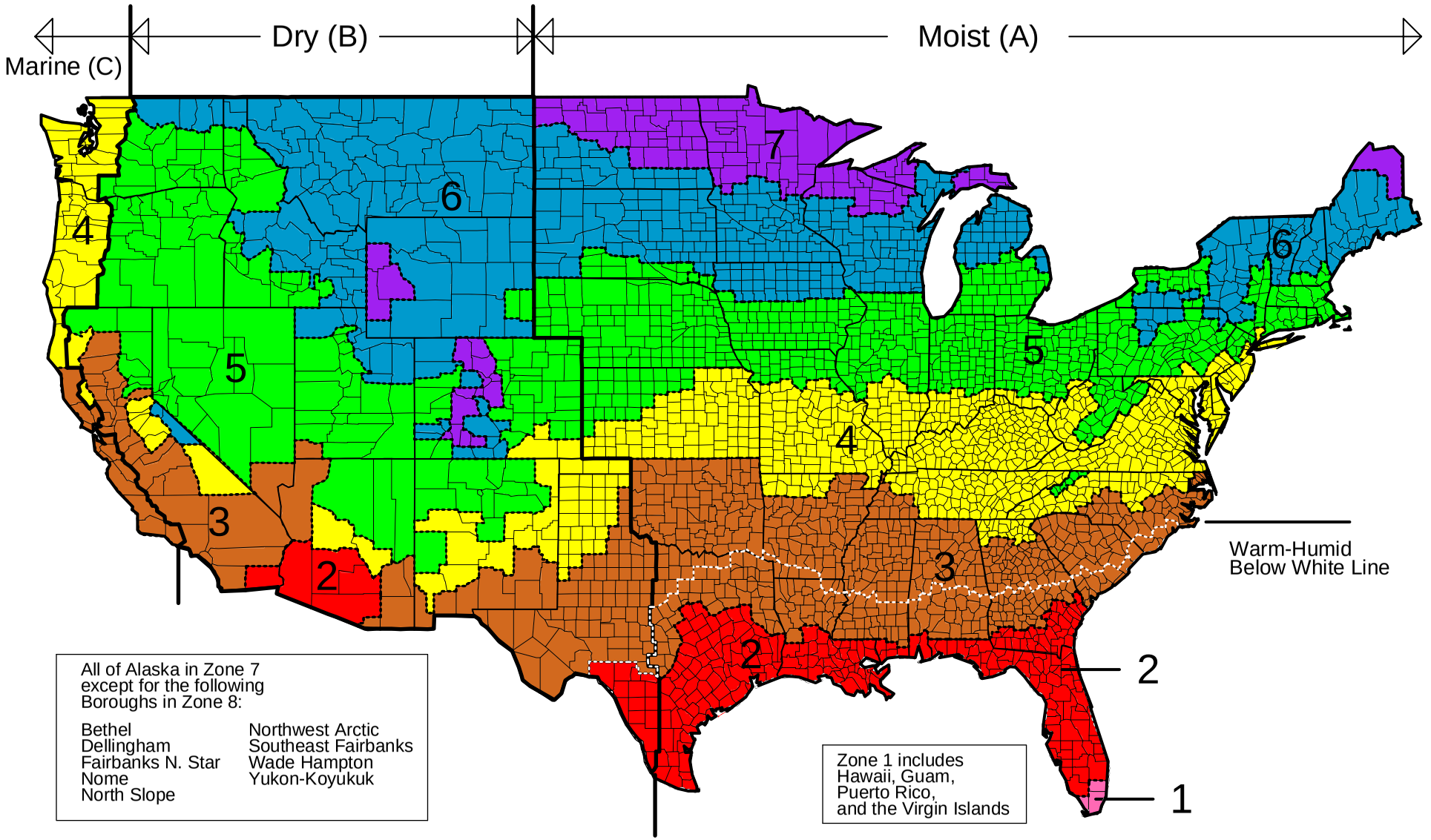
EA 11:
Refrigerant Management
Max Points: 1

Synopsis: NOT LIKELY(0 points)

Description:

Although refrigerant management can ensure better performance of mechanical cooling systems and minimize contributions to ozone depletion and global warming, we are choosing not to focus on this single-point credit.

Map of DOE's Proposed Climate Zones



APPENDIX B-EA1.1

March 24, 2003

APPENDIX B-EA1.2

Expanded Project Checklist
Version 1.11

☑ Expanded

Reset All to Zero

Relocate Checkboxes

Builder Name:	**EcoUrban Homes**
Home Address (Street/City/State):	**3140 Pennsylvania Ave, St.Louis, MO 63118**

Version: 7b

Short List

Y / Pts No N/A

Input Values:

No of Bedrooms:	3		Floor Area (sf):	1,900	
Area of Lot (sqft):	3,750	sqft	0.086	Acre	
Area under Roof (sqft):	1,277	sqft	Area of Hardcapes (sf):	774	
Number of units:	1	units	IECC Climate Zone:	4	

Minimum No. of Points Required:

	Certified	Silver	Gold	Platinum
Required	45	60	75	90
Intended	67	67	67	67
Achieved	96	96	96	96

Print Date: 6/12/07 12:01 PM

Detailed information on the measures below are provided in the companion document "LEED for Homes Rating System"

Pts. Intended | **Pts. Achieved** | **Max Pts. Available**

Project Team/Accountability List

Initials	Full Name	Roll	Company	Address	Phone
Bld	Jay Swoboda	Builder	EcoUrban Homes	906 Olive Street, Suite 1212, St. Louis, MO 63101	314-231-0400
Rtr	Edward Fieser	Rater	MaxHome, LLC	476 Old Smizer Mill Rd, Fenton, MO 63026	314-703-6212
Arc	Garen Miller	Archtect	Garen Miller, AIA	5115 St. Charles Place, 63119	314-645-1777
Larc	Simon Barker	Landscape Arch	Barker Horticultural Services	29800 Pike 235, Clarksville, MO 63336	573-242-3300
Lan	Mark LaBarge	Landscaper	SFP Landscaping, Inc.	9800 Gravois Road, St. Louis, MO 63123	314-544-4436
Plu	Alberto Vushaj	Plumber	Vushaj Development	300 E. Courtois, St. Louis, MO 63111	314-631-5422
Ins	Edward Fieser	Insulator	MaxHome, LLC	476 Old Smizer Mill Rd, Fenton, MO 63026	314-703-6212
HVAC	Greg Gudermuth	HVAC	J. Williams Heating & Cooling	3901 Shirley Drive, St. Louis, MO 63121	314-426-8989
Light	Don Diamond	Lighting Contractor	Diamond Electric	5836 Victoria Ave., St. Louis, MO 63110	314-566-8596
WaterProof	John Zinger	Water Proofing	Quality Waterproofing	105 Pacific West Dr., Pacific, MO 63069	314-574-2678
Siding	Mike Akridge	Siding	CCL Construction, LLC	217 Heyden Dr. Eureka, MO 63025	314-565-8894
Found	Ed Belke	Foundation	EB Construction	PO Box 450, Imperial, MO 63052	314-277-8807
Floor	JJs Flooring	Flooring	JJs Flooring	2301 Gravois, St. Louis, MO 63104	314-772-3996

Responcability | Sign-off | Green Rater Sign-off

5 Innovation and Design Process (ID) — (Minimum of 0 ID Points Required) — 5 — 9

Y	**Integrated Project Planning**		1.1	Preliminary Rating Target performance tier: Silver		Y	Prerequisite	1.1	
1			1.2	Integrated Project Team ☑ Individuals or organizations with various capabilities ☑ All team members involved in various project phases ☑ Monthly meetings held with project team		1	1	1.2	Bld
			1.3	Design Charrette		1	1	1.3	Bld
Y	**Quality Management for Durability**		2.1	Durability Planning; (Pre-Construction) ☑ Durability Evaluation completed ☑ Strategies developed to address durability issues ☑ Durability strategies incorporated into project documentation		Y	Prerequisite	2.1	Bld
Y			2.2	Wet Room Measures ☑ Non-paper-faced backer board used ☑ Water-resistant flooring used in appropriate areas ☐ Drain and drain pan installed for any water heaters in or over living space ☑ Drain and drain pan installed for any washers in or over living space		Y	Prerequisite	2.2	
Y			2.3	Quality Management		Y	Prerequisite	2.3	
3			2.4	Third-Party Durability Inspection ☑ Builder completed the Durability Inspection Checklist ☑ Third-party verified and checked-off on items in Durability Inspection Checklist		3	3	2.4	
	Innovative / Regional Design		3.1	Approved ID Request name and identification #:			1	3.1	
1			3.2	Approved ID Request name and identification #:	Flat Roof with white color		1	3.2	
			3.3	Approved ID Request name and identification #:			1	3.3	
			3.4	Approved ID Request name and identification #:			1	3.4	

8 Location and Linkages (LL) — (Minimum of 0 LL Points Required) — Or — 10 — 10

HOLD	**LEED-ND**		1	LEED-ND Neighborhood	LL2-5	Not avail.	10	1	
2	**Site Selection**		2	Avoid Environmentally Sensitive Sites and Farmland ☑ Not built at elevation lower than 100-year flood defined by FEMA ☑ Not built on land identified as habitat for any threatened or endangered species ☑ Not built within 100 ft. of wetlands or areas of special local or state concern ☑ Not built on land that was public parkland prior to acquisition ☑ Not built on prime farmland, as defined by US Dept of Agriculture	LL1	2	2	2	Bld
2	**Preferred Locations**		3.1	Select Edge Development Site	LL1	2	1	3.1	
			3.2	***OR*** Select Infill Site	LL1		2	3.2	
			3.3	Select Previously Developed Site	LL1	1	1	3.3	
1	**Infrastructure**		4	Site within 1/2 Mile of Existing Water and Sewer	LL1	1	1	4	

Expanded Project Checklist
Version 1.11

Expanded

Builder Name:	**EcoUrban Homes**
Home Address (Street/City/State):	**3140 Pennsylvania Ave, St.Louis, MO 63118**

Reset All to Zero

Relocate Checkboxes

Version: 7b

Short List

Y / Pts No N/A

Input Values:

No of Bedrooms:	3		Floor Area (sf):	1,900	
Area of Lot (sqft):	3,750	sqft	0.086	Acre	
Area under Roof (sqft):	1,277	sqft	Area of Hardcapes (sf):	774	
Number of units:	1	units	IECC Climate Zone:	4	

Minimum No. of Points Required:

	Certified	Silver	Gold	Platinum
Required	45	60	75	90
Intended	67	67	67	67
Achieved	96	96	96	96

Print Date: 6/12/07 12:01 PM

Detailed information on the measures below are provided in the companion document "LEED for Homes Rating System"

Pts. Intended				Pts. Achieved	Max Pts. Available				
11	**Energy and Atmosphere (EA) Prescriptive Path Continued**		(Minimum of 0 EA Points Required)	16	38				
Y	**Windows**	4.1	Windows Meet ENERGY STAR for Windows: U-Value ≤ 0.40 SHGC ≤ 0.45 IECC climate region: 4 Window U-Factor: 0.310 Window SHGC: 0.280	Y	Prerequisite	4.1			
		4.2	OR Windows Meet ENERGY STAR for Windows by ≥ 10%: U-Value ≤ 0.35 SHGC ≤ 0.40		2	4.2			
		4.3	OR Windows Meet ENERGY STAR for Windows by ≥ 20%: U-Value ≤ 0.32 SHGC ≤ 0.40	3	3	4.3			
Y	**Duct Tightness**	5.1	Third-Party Duct Leakage Tested </= 4.0 CFM25 / 100 SF to Outside (76 CFM25) Duct air leakage to outdoors: 76 CFM 25 (4 cfm25/100sf) ☐ No ducts installed in exterior walls ☑ Ducts installed in exterior walls have sufficient insulation to maintain overall UA ☐ R-6 duct insulation around ducts in unconditioned spaces ☑ Non-ducted HVAC has R-3 insulation around pipes in unconditioned spaces	Y	Prerequisite	5.1			
		5.2	OR Third-Party Duct Leakage Tested </= 3.0 CFM25 / 100 SF to Outside (57 CFM25) ☐ All ducts in conditioned spaces ☐ Non-ducted HVAC system entirely within conditioned envelope		2	5.2			
		5.3	OR Third-Party Duct Leakage Tested </= 1.0 CFM25 / 100 SF to Outside (19 CFM25) ☐ All ducts in conditioned spaces ☐ Non-ducted HVAC system has outdoor reset controls		3	5.3			
Y	**Space Heating and Cooling**	6.1	ENERGY STAR HVAC w/ Manual J, Energy Star Programable Thermostat & refrigerant charge test Type of equipment: Central A/C - Furnace Cooling efficiency: 16 SEER / EER (Required: ≥13 SEER) Heating efficiency: 93 AFUE / HSPF / COP (Required: ≥90 AFUE) ☑ Manual J or Equivalent Load Calculation Provided ☑ ENERGY STAR labeled programmable thermostat ☑ Proof of proper refrigerant charge ☐ No mechanical cooling system	Y	Prerequisite	6.1	HVAC		
2		6.2	High-efficiency HVAC Cooling Required: ≥14 SEER Heating Required: ≥92 AFUE	2	2	6.2			
		6.3	OR Very High-efficiency HVAC Cooling Required: ≥15 SEER Heating Required: ≥94 AFUE		4	6.3			
	Water Heating	7.3	Improved Water Heating Equipment Type of equipment: Gas Fired (40 Gallons) DHW equipment efficiency: 0.59 EF / CAE (0.61 Required) % of annual load met by solar: %		3	7.3			
Y	**Lighting**	8.1	Install at Least Three ENERGY STAR labeled Light Fixtures (or CFLS) ☑ Three ENERGY STAR labeled fixtures ☑ Three ENERGY STAR labeled CFLs ☐ Three LED lights ☐ ENERGY STAR lights in high-use rooms	Y	Prerequisite	8.1			
2		8.2	Energy Efficient Fixtures and Controls ☑ Motion sensor controls on all outdoor light fixture ☐ Four wireless photovoltaic exterior lights ☑ Three additional ENERGY STAR labeled light fixtures ☑ Three additional ENERGY STAR labeled CFLs ☐ Three additional LEDs		2	8.2				
		8.3	OR ENERGY STAR Advanced Lighting Package ☑ 50% of all fixtures in high-use rooms are ENERGY STAR ☑ 25% of all fixtures in medium- or low-use rooms are ENERGY STAR ☑ 50% of all outdoor fixtures are ENERGY STAR	3	3	8.3	Light		
2	**Appliances**	9.1	ENERGY STAR Labeled Appliances ☑ ENERGY STAR labeled refrigerator ☐ ENERGY STAR labeled ceiling fans in living room, family room, and bedrooms ☑ ENERGY STAR labeled dishwasher ☑ ENERGY STAR labeled clothes washer	2	2	9.1			
		9.2	Very Efficient Clothes Washer ☑ Clothes washer has modified energy factor > 1.8 ☑ Clothes washer has water factor < 5.5	1	1	9.2			
	Renewable Energy	10	Renewable Electric Generation System (1 Point / 3% Reduction) Type of renewable system: Annual electric load (based on HERS ref home): 17,009 kWh Annual electricity supplied by renewables: kWh % of annual load supplied by renewables: %		10	10			

INCREASED INSULATION

BUILDING ENVELOPE IMPROVEMENT

The U.S. Environmental Protection Agency's **ENERGY STAR® Program** promotes the use of high-efficiency technologies and equipment. ENERGY STAR labeled homes use at least 30% less energy than homes built to meet the national Model Energy Code while maintaining or improving indoor air quality. These fact sheets are designed to help consumers learn more about the energy-efficient improvements to their ENERGY STAR labeled homes.

Proper insulation is a key element for a more comfortable and energy efficient home. It is important to have a continuous boundary of insulation between the conditioned, indoor spaces and the unconditioned, outdoor spaces. This boundary is referred to as the "building envelope" and consists of the walls, floor, and ceiling or roof. Low insulation levels and gaps or voids in the insulation materials can provide paths through which heat and air can easily flow into or out of the residence. Care must be taken to shape the insulation material around piping and electrical work without compressing it.

Building codes typically require a minimum insulation level for each component of the building envelope. These levels vary from state to state depending on climate conditions. In most climates, it is both easy and cost effective to increase these insulation levels beyond the minimum code requirements (see Figure 1 below for recommended levels).

Insulation materials available include batt-type, loose fill, rigid foam panels, and spray-type. Insulation materials are rated according to their ability to resist heat flow. This thermal resistance rating is commonly known as an "R-value". The higher the R-value of a material, the better its ability to resist heat flow. The reciprocal of the R-value is the U-value, which characterizes the rate of heat loss.

If moist air gets inside the building envelope and condenses on cold surfaces, it can cause damage to the insulation and building structure. In cold climates it is recommended to keep the insulation and envelope cavities dry by applying a vapor retarder or low permeability paint to the warm side of the envelope.

Look for ENERGY STAR labeled homes to include insulation levels that exceed code requirements with materials carefully installed to ensure rated performance.

FIGURE 1: COST EFFECTIVE INSULATION R-VALUES[a]

If you live in a climate that is…	and your heating system[b] is a…	then insulate to these levels in the…			
		ceiling	wood frame walls[c]	floor	basement/ crawl space walls[d]
Warm with cooling and minimal heating requirements (i.e., FL & HI;coastal CA; southeast TX;southern LA, AR, MS, AL & GA).	gas/oil or heat pump	R-22 to R-38	R-11 to R-15	R-11 to R-13	R-11 to R-19
	electric resistance	R-38 to R-49	R-11 to R-22	R-13 to R-25	R-11 to R-19
Mixed with moderate heating and cooling requirements (i.e.,VA, WV, KY, MO, NE, OK, OR, WA & ID; southern IN, KS, NM & AZ;northern LA, AR, MS, AL & GA; inland CA & western NV).	gas/oil or heat pump	R-38	R-11 to R-22	R-13 to R-25	R-11 to R-19
	electric resistance	R-49	R-11 to R-28	R-25	R-11 to R-19
Cold (i.e., PA, NY, New England, northern Midwest, Great Lakes area, mountainous areas (e.g., CO, WY, UT, etc.)).	gas/oil	R-38 to R-49	R-11 to R-22	R-25	R-11 to R-19
	heat pump or electric	R-49	R-11 to R-28	R-25	R-11 to R-19

a. Adapted from the U.S. Department of Energy 1997 Insulation Fact Sheet.

b. Insulation is also effective at reducing cooling bills. These levels assume that you have electric air-conditioning.

c. R-Values are for insulation only (not whole wall) and may be achieved through a combination of cavity (batt, loose fill or spray) and rigid board materials.

d. Do not insulate crawl space walls if crawl space is wet or ventilated with outdoor air.

INCREASED INSULATION

BUILDING ENVELOPE IMPROVEMENT

RESOURCES

The Consumer Guide to Home Energy Savings (Wilson and Morrill) 5th edition, 1996, available from the American Council for an Energy Efficient Economy at 510-549-9914

Homemade Money (Heede and the staff of RMI), 1995, available from the Rocky Mountain Institute at 970-927-3851

The following fact sheet is available by calling the U.S. Environmental Protection Agency's toll-free ENERGY STAR Hotline at 1-888-STAR-YES (1-888-782-7937): ***Air Sealing***.

Insulation fact sheet available from the Energy Efficiency and Renewable Energy Clearinghouse (EREC), P.O. Box 3048, Merrifield, VA 22116, 1-800-DOE-EREC (1-800-363-3732)

Consumer Guide to Insulation (Jeanne Byrne), September/October 1996 issue of *Home Energy Magazine*. Reprints available from the publisher at 510-524-5405 or http://www.homeenergy.org

BENEFITS

Increased insulation can provide many benefits including:

Improved comfort. Increased insulation reduces conductive heat losses and gains resulting in warmer interior surfaces in the winter and cooler interior surfaces in the summer. Approximately 40 percent of our physical comfort in homes is due to radiant heat exchange between our bodies and the surrounding interior surfaces. Increased insulation reduces this radiant heat exchange and minimizes temperature differences between rooms, thus maintaining a more consistent level of comfort throughout a house.

Improved indoor air quality. When insulation levels are increased and materials properly installed, there are fewer gaps and voids through which unconditioned air can leak into a house. This helps avoid dirt, dust, and other impurities that can negatively affect indoor air quality. A tight building envelope is a critical component to ensure good indoor air quality.

Increased construction quality. Building codes establish the legal minimum construction standards. ENERGY STAR labeled homes are constructed to significantly exceed these codes. Figure 2 shows that to increase insulation levels, builders must install an insulation material with a higher R-value or increase the thickness of the building envelope component. In either case, the result is better quality construction. This is particularly true in cases where special care is taken during installation to insure no gaps or voids are left in the insulation.

Reduced obsolescence. Based on recent trends for improved efficiency, building envelopes with increased insulation levels are expected to become industry practice. Since it is both difficult and costly to increase insulation after a house is built, it is best to increase insulation levels during the original construction. ENERGY STAR labeled homes are constructed to exceed minimum building codes requirements are, therefore, expected to be less vulnerable to obsolescence.

Lower utility bills. More than 40 percent of the energy consumed in a typical household goes to heating and cooling. Increased insulation reduces this energy consumption which lower energy consumption results in lower utility bills.

Improved resale position. Increased insulation levels can provide the many impressive benefits listed above resulting in a more comfortable, higher quality home with better indoor air quality and lower utility bills. These benefits can translate into higher resale value.

FIGURE 2: R-VALUES FOR VARIOUS INSULATION MATERIALS

Insulation Material	R-value per inch of Thickness
Batt-type	3.1 to 3.5
Loose fill	2.9 to 3.7
Board stock	3.5 to 6.2
Spray-type	3.5 to 6.0

The Icynene Insulation System® and The U.S. Green Building Council's LEED™ Green Building Rating System: Together Contributing To a Healthier Indoor Environment

The U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED™) Green Building Rating System, launched in March 2000, defines what a "green" building is. Through the process of attaining credits for using recommended strategies, a building achieves certification as a green building. The more credits a building achieves, the higher the level of certification awarded. Icynene®, the only fully-integrated insulation system offering a Healthier, Quieter, More Energy Efficient® solution to maximum indoor air quality, can also contribute to achieving the following LEED prerequisites and credits:

LEED Credit Category - Energy & Atmosphere

Prerequisite 2 - Minimum Energy Performance

Requires the building to comply with ASHRAE/IESNA Standard 90.1-1999 (without amendments) or the local energy code, whichever is more stringent.	Icynene® can help achieve this prerequisite by significantly lowering air leakage of building envelope.

Credit 1 - Optimize Energy Performance

Requires a reduction in design energy cost compared to the energy cost budget.	Icynene® can help achieve a reduction of up to 50% in energy consumption.

LEED Credit Category - Materials & Resources

Credit 2 - Construction Waste Management

Requires recycling and/or salvaging construction, demolition and land clearing waste.	Icynene®'s composition contributes a significantly lower amount of waste materials by weight, which can help a project divert a minimum of 50% of waste from the landfill.

Icynene Inc. 6747 Campobello Rd. Mississauga, ON L5N 2L7, CANADA
Tel: 800-758-7325 www.icynene.com Fax: 905-363-0102

Credit 5 - Local/Regional Materials

Requires use of building materials and products that are manufactured regionally within a radius of 500 miles of the project site.	Since the final assembly of Icynene®'s components occurs at the project site it is considered to have been manufactured on site.

LEED Credit Category - Indoor Environmental Quality

Credit 7 - Thermal Comfort

Requires a thermally comfortable environment that supports the productivity and well being of building occupants.	Icynene® can help a building comply with ASHRAE Standard 55-1992, Addenda 1995, for thermal comfort standards including humidity control within established ranges per climate zone because it eliminates random outside air infiltration and produces a tighter building envelope.

LEED Credit Category - Innovation & Design Process

Credit 1 - Innovation in Design

Provides design teams and projects with an opportunity to be awarded points for exceptional performance above the requirements set by the LEED Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED Green Building Rating System.	Icynene®'s unique performance characteristics and flexible installation process can contribute to this credit in a number of ways. Areas that are difficult to insulate with traditional materials rarely pose a problem with Icynene®, thereby increasing design flexibility and enhancing energy efficiency. Icynene® is also extremely effective at controlling air borne sound movement, making Icynene® insulated buildings quieter than those insulated with traditional materials. In addition, Icynene® has a lifetime warranty and does not ever shrink, sag, or settle, thereby preserving its insulation value throughout its lifetime.

The above are suggestions only. It is recommended that a complete review of the LEED Green Building Rating System be made prior to applying for the listed prerequisites and credits. The LEED System can be reviewed at www.usgbc.org.

Properly Installed Insulation

Improves Comfort While Saving Energy

Insulation is one of the keys to a comfortable, energy-efficient home. But simply having the right amount of insulation is not enough. If insulation is not properly installed, a home can have excessive heat gain during the summer and heat loss in the winter—forcing the heating and cooling systems to work overtime.

Properly installed insulation will completely blanket the home—exterior walls, ceiling, and floors—without gaps, voids, or compressions, and it will be in full contact with the interior air barrier (for example, drywall). Continuous sealing of the air barrier along the insulation is also critical to protecting against moisture damage that can be caused by warm air flow through the insulation to colder surfaces where it can condense. Expect ENERGY STAR qualified homes to have insulation that meets or exceeds the latest national code requirements, providing year-round comfort while reducing utility bills.

BENEFITS OF PROPERLY INSTALLED INSULATION

- **Enhanced Comfort.** Properly installed insulation minimizes temperature variability indoors and helps keep rooms warmer in the winter and cooler in the summer.

- **Lower Utility Bills.** As much as half of the energy used in your home goes to heating and cooling. By preventing heat loss in the winter and heat gain in the summer, a properly installed insulation barrier reduces utility bills year round.

- **Improved Durability.** When insulation is properly installed, the potential for condensation that can lead to decay of building materials is reduced, helping to improve the durability of your home.

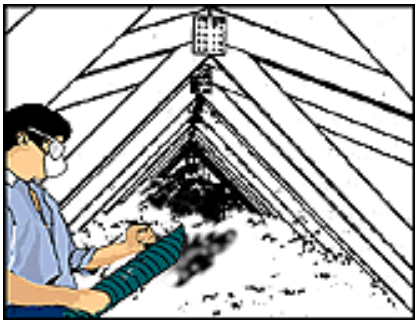
- **Better Resale Position.** The improved comfort, lower utility bills, and improved durability of a properly installed insulation barrier can translate into higher resale value compared to less efficient homes.

TYPES OF INSULATION

Builders have many choices for the types of insulation they use. All insulation can be effective if it is properly installed and coupled with a continuous air barrier. Insulation materials are rated according to their ability to resist heat flow. This thermal resistance rating is commonly known as an "R-value." The higher the R-value, the better the material is at resisting heat flow. ENERGY STAR qualified homes can include one or more of the following types of insulation:

Batt Insulation is typically made from mineral fiber (fiberglass or rock wool) and manufactured in blankets of various sizes and thicknesses. Batt insulation is typically fitted between studs, joists, and beams and should fill the wall, floor, or ceiling cavity without any gaps, voids, or compression.

Blown-in Insulation is typically made from fiberglass or cellulose and is literally blown into the walls and attic through a large hose. Blown-in insulation should completely fill the wall cavities and be an even thickness throughout the attic.



Blown-in attic insulation

Sprayed or Injected Foam Products are typically made from polyurethane or similar products and are injected or sprayed into cavities where they expand to the desired thickness.

Rigid Insulation is typically made from polystyrene, polyurethane, or polyisocyanurate foam, which is expanded or formed into large sheets. Rigid insulation can be used to provide a continuous thermal barrier in basements, crawlspaces, and on exterior walls.

A BETTER FUTURE

ENERGY STAR is a voluntary partnership between the government and more than 9,000 organizations, including more than 3,500 of the nation's home builders. Together with home buyers and their families, we are working to achieve a common goal—protecting the environment for future generations by changing to more energy-efficient practices and products today.

ENERGY STAR is the government-backed symbol for energy efficiency. It identifies new homes, buildings, and more than 50 types of products that are energy efficient and offer the features, quality, and performance that today's consumers expect. Products that can earn the ENERGY STAR include windows, heating and cooling equipment, lighting, and appliances. To learn more about ENERGY STAR, visit www.energystar.gov.

LEARN MORE AT energystar.gov

ENERGY STAR®, a U.S. Environmental Protection Agency program, helps us all save money and protect our environment through energy efficient products and practices. For more information, visit www.energystar.gov.

Independent Inspection and Testing

Helps Make Sure a Home is Energy Efficient

All new homes look great from the outside. But to make sure that your next new home is truly energy efficient, it's important to look "behind the walls." How can home buyers really be sure? Look for homes that have earned the ENERGY STAR—these homes have been inspected and tested by an independent Home Energy Rater. These professionals advise builders how to select the most appropriate energy-efficient features for a home; Raters inspect and test the home during and after construction to verify that the home meets EPA's strict guidelines for energy efficiency.

BENEFITS OF INDEPENDENT INSPECTION AND TESTING

- **Peace-of-Mind for Making a Smart Purchase**. Before buying a used car, consumers often take the car to a trusted mechanic not affiliated with the seller to have an expert verify its performance. This helps ensure they are making a smart purchase. Homebuyers can have similar peace-of-mind by looking for the ENERGY STAR label—typically located on a home's circuit breaker box. This label assures homebuyers that the home has been verified by an independent Home Energy Rater to be truly energy efficient. In addition to lowering monthly utility bills, the energy efficiency features typically found in ENERGY STAR qualified homes can also contribute to improved home durability and homeowner comfort.

Look for the ENERGY STAR on the breaker box of your next home.

- **Climate-Specific Recommendations**. An energy-efficient home built in Florida would not necessarily be energy efficient if it were built in Michigan. For a home to be energy efficient, it must be designed for regional weather characteristics. Home Energy Raters are trained in climate-effective energy saving techniques, and their knowledge and field experience helps ENERGY STAR builder partners construct high-quality, energy-efficient homes.

- **Additional Inspections for Quality**. Homes that earn the ENERGY STAR typically undergo more inspections and testing than code-built homes. The ENERGY STAR verification process helps identify and correct mistakes before they are hidden behind the walls and holds builders constructing ENERGY STAR qualified homes to a higher standard. As a result, independent inspection and testing can help improve the quality and energy efficiency of a home.

HOW INSPECTION AND TESTING WORKS

Home Energy Rater performs a blower door test.

Home Energy Raters are trained to evaluate construction techniques, take key measurements, and perform inspections and testing procedures to verify a home's efficient performance. Here's how the process works:

Selection of Energy-Efficient Features. Raters help builders choose energy-efficient features for their ENERGY STAR qualified homes in two ways:

- With a **traditional Home Energy Rating**, a Rater simulates a home's energy use with specialized computer software. The results of this analysis allow the Rater to identify the most effective upgrades to meet ENERGY STAR performance guidelines.
- With a **Builder Option Package,** a Rater does not calculate the home's energy use. Instead, the builder and Rater use a set of climate-specific construction specifications developed by EPA called a Builder Option Package (BOP). Based on extensive analyses, the BOP specifications have been determined to result in homes that consistently meet ENERGY STAR guidelines.

Completion of Field Verification. Regardless of how the energy efficiency features are selected, Home Energy Raters must also conduct on-site inspections and testing of a home. This field verification ensures that energy-saving measures are consistent with ENERGY STAR guidelines. The process usually includes a blower door test (to test the leakiness of the house), a duct blaster test (to test the leakiness of the duct system), and completion of a thermal bypass checklist (a visual inspection of common construction areas where air can flow through or around insulation).

The standards for Home Energy Ratings, inspection protocols, and testing guidelines are maintained by the Residential Energy Services Network (RESNET). For more information, visit the RESNET Web site at www.resnet.us.

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RESNET
Residential Energy Services Network

Setting the STANDARD for QUALITY

The Residential Energy Services Network's (RESNET®) mission is to ensure the success of the building energy performance certification industry, set the standards of quality, and increase the opportunity for ownership of high performance buildings. RESNET is a membership 501-C-3 non profit organization.

RESNET's standards are officially recognized by the U.S. mortgage industry for capitalizing a building's energy performance in the mortgage loan, certification of "White Tags" for private financial investors, and by the federal government for verification of building energy performance for such programs as federal tax incentives, the Environmental Protection Agency's ENERGY STAR program and the U.S. Department of Energy's Building America Program.

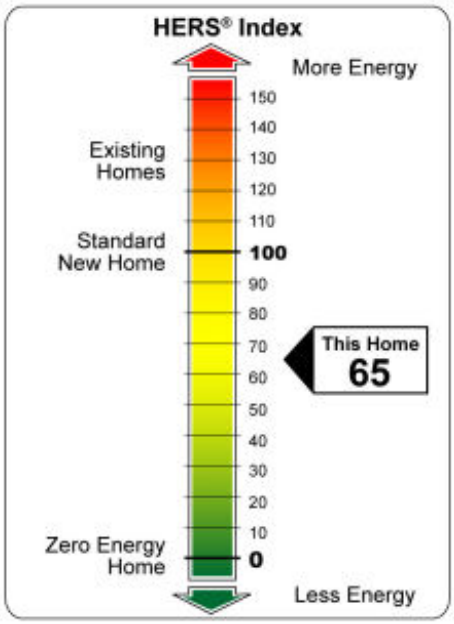
What and How of Becoming a Rater
Learn how to become a certified rater
Click Here

IRS Releases Rules for Tax Credits
Click Here

Consumer Resources
Find a Certified Energy Rater
Click Here

HERS®
Home Energy Rating System

[illegible] relative energy use index called the HERS® Index – a HERS Index of 100 represents the energy use of the "American Standard Building" and an Index of 0 (zero) indicates that the Proposed Building uses no net purchased energy (a Zero Energy Building). A set of rater recommendations for cost-effective improvements that can be achieved by the Rated Building is also produced.



Click to Enlarge

RESNET standards encompass three areas:

- Software accreditation achieved by passing a battery of software verification tests developed by U.S. National Laboratories and RESNET
- Definition of knowledge base and skill sets that a rater must demonstrate through passing an online RESNET National Rater Test
- A quality assurance evaluation that features each Rating Provider employing a certified Quality Assurance Designee. The Quality Assurance Designee must annually independently verify internal consistency of a minimum 10% of all building input files and independently field verify the accuracy of a minimum of 1% of each certified Rater's homes

For more information on RESNET click on What is RESNET.

For information on membership to RESNET click here.

HOT NEWS

RESNET Green Rater Training to be Offered at the 2009 RESNET Conference
Sign up for this designation opportunity

RESNET Seeking Volunteers to Commecial Building Energy Performance Index Task Force
Learn about this opportunity

RESNET Adopts Plan for Repossessed Homes
Download the Home Energy Improvement Initiative

RESNET Seeking Volunteers to Serve on New Standing Standards Committee
Learn about this opportunity

RESNET Adopts Residential Energy Efficiency Initiatives for New President & Congress
Download the policy initiatives

Statements of 2008 Candidates for the RESNET Board
See the Statements of RESNET Board Candidates

RESNET Forms Existing Homes Software Task Force
Learn about this new task Force

What and How of Becoming a Rater
Learn how to become a certified energy rater

RESNET & BPI Propose New Joint Comprehensive Home Energy Audit Standard
Review and comment on proposed new joint standard

RESNET Adopts National Energy Audit Standard

RESNET Forms International Initiatives Task Force
Learn about this new task force

2009 RESNET Rating Industry Awards
Applications are now being accepted

RESNET Forms Task Force on National Building Registry
Learn about this new task force

RESNET Forms Task Force on RESNET Green Rater Certification
Learn about this new task force

RESNET Forms Task Force to Develop Infrared Scanning Standard
Learn about new task force

Map of RESNET Certified Raters in US
View map

RESNET Adopts New Policy on Certification of Quality Assurance Designees
View new policy

P.O. Box 4561, Oceanside, CA 92052-4561, (760) 806-3448
Send Comments, Questions or Suggestions to: info@natresnet.org

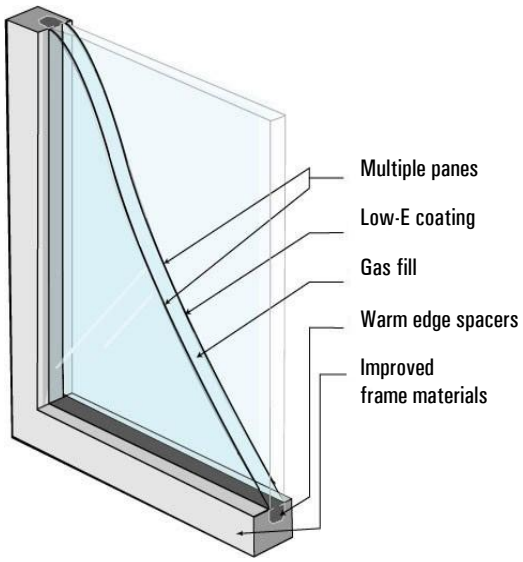
ENERGY STAR Qualified Windows

Protect the Home and Increase Comfort

Windows provide natural daylight and views, but homeowners often use drapes or blinds to cover them because of comfort concerns. ENERGY STAR qualified windows and skylights allow owners to enjoy the light and views while saving money on utility bills and protecting valuable furnishings and finishes from sun damage. Independently tested for superior energy performance, ENERGY STAR qualified windows and skylights are also better for the environment because lowering energy use helps reduce the emissions of greenhouse gases and air pollutants at the source.

BENEFITS OF ENERGY STAR QUALIFIED WINDOWS AND SKYLIGHTS

- **Energy Savings.** ENERGY STAR qualified windows and skylights feature advanced technologies such as invisible glass coatings, vacuum-sealed spaces filled with inert gas between the panes, improved framing materials, better weather stripping, and warm edge spacers, all of which reduce undesirable heat gain and loss.



- **Improved Comfort.** Compared to less efficient windows, ENERGY STAR qualified windows help keep homes warmer in the winter and cooler in the summer. This is because they can block 70 percent or more of the solar heat gain in the summer and reflect radiant heat indoors during winter.

- **Protection of Your Home's Interior.** Photographs, furniture, flooring, and window treatments can fade or discolor after repeated exposure to direct sunlight. An ENERGY STAR qualified window with special (Low-E) coatings can reduce fading. These coatings can reduce fading by up to 75 percent.

- **Reduced Condensation.** If an inefficient window or window frame gets too cold, water can condense (or even freeze) on the interior surface and then pool on the sill. Over time, chronic condensation can damage window sills, cause paint to crack, and encourage the growth of mold. Advanced frames, glass coatings, spacers, and other technologies enable ENERGY STAR qualified windows to keep the inner surface of the glass and frame warmer, reducing the potential for condensation and ensuring a clearer view on winter mornings.

LOOK FOR THE ENERGY STAR

To find energy-efficient windows and skylights, simply look for the ENERGY STAR. The ENERGY STAR guidelines for windows and skylights are tailored to four climate zones. For example, windows in the North are optimized to reduce heat loss in the winter, while windows in the South are optimized to reduce heat gain during the summer. This explains why windows that are energy efficient in Florida will not necessarily be energy efficient in Michigan.

Sample ENERGY STAR Label for Products Qualified in All Climate Zones

INDEPENDENT TESTING FOR ENERGY PERFORMANCE

The energy performance of all ENERGY STAR qualified windows and skylights is independently tested and certified according to procedures established by the National Fenestration Rating Council (NFRC). NFRC is a third party, non-profit organization that sponsors certified rating and labeling programs to help consumers compare the energy and performance features of windows and skylights.

A BETTER FUTURE

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Performance Data

APPENDIX B-EA4.2

Canadian Product Performance Ratings

Tested to: CAN/CSA A440-M90 The mullion was tested and the deflection was within the maximum allowable of L/175 at positive and negative loads of 2600 Pa.

Units Tested	Air Tightness	Water Tightness	Wind Load Resistance and blow-out	Resistance to forced entry
CX16	A-3	B-7	C-4	Pass
P6050	Fixed	B-7	C-4	Not Applicable
A41	A-3	B-3	C-5	Pass
AXW51	A-2	B-2	C-2	Pass
TW3862	A-3	B-2	C-2	Pass
NL3862	A-3	B-3	C-3	Pass
DHP5662	Fixed	B-3	C-3	Not Applicable
G65	A-3	B-2	C-3	Pass
Cir/Ovl 3048	Fixed	B-7	C-5	Not Applicable
ET8	Fixed	B-7	C-5	Not Applicable

Units Tested	Air Tightness	Water Tightness	Wind Load Resistance and blow-out	Resistance to forced entry
FX-12050	Fixed	B-7	C-5	Not Applicable
AF-608	Fixed	B-7	C-5	Not Applicable
SP-802	Fixed	B-7	C-5	Not Applicable
FWH6080AP	A-3	B-2	C-3	Pass
9080SASR	A-3	B-2	C-3	Pass
FWO6080AP	A-3	B-4	C-3	Not Applicable
3180	A-3	B-4	C-3	Not Applicable
FWG8080	A-3	B-3	C-1	Pass
160611	A-3	B-2	C-1	Pass
PSG8080	A-3	B-2	C-1	Pass

Andersen NFRC Certified Total Unit Performance

Andersen® windows and patio doors meet or exceed the following standards: WDMA,-I.S.-2, W.D.M.A -I.S.-4 (WDMA license No. 129), Hallmark certified. Independent testing laboratories have performed all required tests on selected sizes. Compliance with these standards is confirmed by ongoing testing in Andersen Laboratories. These products are covered by one or more of the following patents: 4,999,950; 5,595,409; 5,775,749; 6,055,786; 5,544,450; 5,566,507; 5,582,445; 5,097,629; 5,740,632; 5,199,234; D312,565; D397,604; and D417,831. Other patents pending.

Andersen® 400 Series Product Type		Without Grilles		With Grilles	
		HP Low-E4®	HP Low-E4 Sun	HP Low-E4	HP Low-E4 Sun
Casement 24" x 48" size	U-Factor[1]	0.30	0.31	0.31	0.32
	SHGC[2]	0.34	0.20	0.31	0.18
	VT[3]	0.55	0.30	0.50	0.27
Awning 48" x 24" size	U-Factor[1]	0.30	0.31	0.31	0.31
	SHGC[2]	0.33	0.20	0.30	0.18
	VT[3]	0.54	0.30	0.49	0.27
Casement/Awning Picture Window 48" x 48" size	U-Factor[1]	0.29	0.29	0.31	0.31
	SHGC[2]	0.36	0.21	0.33	0.19
	VT[3]	0.60	0.33	0.54	0.30
Woodwright® Full-Frame Double-Hung 36" x 60" size	U-Factor[1]	0.31	0.32	0.33	0.34
	SHGC[2]	0.32	0.19	0.29	0.17
	VT[3]	0.53	0.29	0.47	0.26
Woodwright® Full-Frame Picture Window 48" x 48" size	U-Factor[1]	0.30	0.30	0.31	0.32
	SHGC[2]	0.34	0.20	0.30	0.18
	VT[3]	0.56	0.31	0.50	0.27
Woodwright® Full-Frame Transom 48" x 48" size	U-Factor[1]	0.30	0.30	0.30	0.30
	SHGC[2]	0.35	0.20	0.31	0.19
	VT[3]	0.58	0.32	0.52	0.29
Woodwright® Insert Double-Hung 36" x 60" size	U-Factor[1]	0.33	0.33	0.34	0.34
	SHGC[2]	0.33	0.19	0.29	0.18
	VT[3]	0.54	0.30	0.48	0.26
Woodwright® Insert Picture Window 48" x 48" size	U-Factor[1]	0.31	0.31	0.32	0.32
	SHGC[2]	0.34	0.20	0.30	0.18
	VT[3]	0.56	0.31	0.50	0.27
Woodwright® Insert Transom 48" x 48" size	U-Factor[1]	0.31	0.32	0.32	0.33
	SHGC[2]	0.34	0.20	0.31	0.18
	VT[3]	0.57	0.31	0.51	0.18
Tilt-Wash Double-Hung 36" x 60" size	U-Factor[1]	0.32	0.32	0.33	0.33
	SHGC[2]	0.33	0.20	0.29	0.18
	VT[3]	0.54	0.30	0.48	0.26
Tilt-Wash Double-Hung Picture 48" x 48" size	U-Factor[1]	0.32	0.32	0.33	0.34
	SHGC[2]	0.35	0.20	0.31	0.19
	VT[3]	0.58	0.32	0.51	0.28
Tilt-Wash Double-Hung Transom 48" x 48" size	U-Factor[1]	0.28	0.29	0.30	0.30
	SHGC[2]	0.33	0.20	0.30	0.18
	VT[3]	0.56	0.31	0.49	0.27
Gliding Window 60" x 36" size	U-Factor[1]	0.33	0.33	0.34	0.34
	SHGC[2]	0.30	0.18	0.27	0.16
	VT[3]	0.50	0.28	0.44	0.24

Andersen® 400 Series Product Type		Without Grilles		With Grilles	
		HP Low-E4	HP Low-E4 Sun	HP Low-E4	HP Low-E4 Sun
Elliptical Window 48" x 48" size	U-Factor[1]	0.30	0.30	0.31	0.32
	SHGC[2]	0.36	0.21	0.32	0.19
	VT[3]	0.60	0.33	0.53	0.29
Circle Top™ Casement 48" x 48" size	U-Factor[1]	0.29	0.29	0.31	0.31
	SHGC[2]	0.36	0.21	0.33	0.19
	VT[3]	0.60	0.33	0.54	0.30
Circle/Oval 48" x 48" size	U-Factor[1]	0.29	0.29	0.31	0.31
	SHGC[2]	0.36	0.21	0.33	0.19
	VT[3]	0.60	0.33	0.54	0.30
Arch Window 48" x 48" size	U-Factor[1]	0.30	0.30	0.31	0.32
	SHGC[2]	0.35	0.20	0.31	0.19
	VT[3]	0.58	0.31	0.52	0.28
Flexiframe® 48" x 48" size	U-Factor[1]	0.29	0.30	0.31	0.31
	SHGC[2]	0.35	0.20	0.31	0.19
	VT[3]	0.58	0.31	0.52	0.28
Springline™ Window 48" x 48" size	U-Factor[1]	0.29	0.30	0.31	0.31
	SHGC[2]	0.35	0.20	0.31	0.19
	VT[3]	0.58	0.31	0.52	0.28
		Tempered		Tempered Laminated	
Skylight 48" x 48" size	U-Factor[1]	0.56	0.56	0.55	0.56
	SHGC[2]	0.41	0.25	0.40	0.24
	VT[3]	0.68	0.38	0.66	0.37
Venting Roof Window 48" x 48" size	U-Factor[1]	0.53	0.54	0.53	0.53
	SHGC[2]	0.38	0.23	0.37	0.22
	VT[3]	0.62	0.34	0.61	0.33
Stationary Roof Window 48" x 48" size	U-Factor[1]	0.53	0.53	0.53	0.53
	SHGC[2]	0.39	0.24	0.38	0.23
	VT[3]	0.64	0.35	0.62	0.34

Please contact your Andersen supplier for performance values on products that include patterned glass, tempered glass other than skylights or roof windows and products ordered with capillary breather tubes.

Skylight and roof window values are based upon NFRC 2001 procedures rated at a 20 degree angle.
Grilles=Finelight or Full Divided light.
"High-Performance Low-E4" (HP Low-E4) and "High-Performance Low-E4 Sun" (HP Low-E4 Sun) are Andersen trademarks for "Low-E" glass.

1 U-Factor defines the amount of heat loss through the total unit in BTU/hr sq. ft².°F. The lower the value, the less heat is lost through the entire product.

2 Solar Heat Gain Coefficient (SHGC) defines the fraction of solar radiation admitted through the glass both directly transmitted and absorbed and subsequently released inward. The lower the value, the less heat is transmitted through the product.

3 Visible Transmittance (VT) measures how much light comes through a product (glass and frame). The higher the value, from 0 to 1, the more daylight the product lets in over the product's total unit area. Visible Transmittance is measured over the 380 to 760 nanometer portion of the solar spectrum.

This data is accurate as of October 17, 2007. Due to ongoing product changes, updated test results, or new industry standards, this data may change over time.

Andersen WINDOWS • DOORS

Andersen NFRC Certified Total Unit Performance

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Andersen® 400 Series Product Type		Tempered w/o Grilles		Tempered w/ Grilles	
		HP Low-E4®	HP Low-E4 Sun	HP Low-E4	HP Low-E4 Sun
Frenchwood® Gliding Patio Door 72" x 82" size	U-Factor[1]	0.32	0.32	0.33	0.33
	SHGC[2]	0.28	0.17	0.24	0.15
	VT[3]	0.45	0.25	0.39	0.22
Frenchwood® Hinged Patio Door - Inswing 38" x 82" size	U-Factor[1]	0.32	0.32	0.33	0.33
	SHGC[2]	0.25	0.15	0.22	0.13
	VT[3]	0.41	0.23	0.35	0.19
Frenchwood® Hinged Patio Door - Outswing 38" x 82" size	U-Factor[1]	0.32	0.32	0.33	0.33
	SHGC[2]	0.26	0.16	0.22	0.14
	VT[3]	0.41	0.23	0.35	0.19
Frenchwood® Patio Door Sidelight 16" x 82" size	U-Factor[1]	0.33	0.33	0.33	0.33
	SHGC[2]	0.23	0.14	0.21	0.13
	VT[3]	0.37	0.21	0.33	0.18
Frenchwood® Patio Door Transom 38" x 14" size	U-Factor[1]	0.31	0.32	0.32	0.32
	SHGC[2]	0.25	0.15	0.22	0.14
	VT[3]	0.40	0.22	0.36	0.20

Andersen® Architectural Products		Without Grilles		With Grilles	
		HP Low-E4	HP Low-E4 Sun	HP Low-E4	HP Low-E4 Sun
Casement Windows Operating (24-1/8" x 48")	U-Factor[1]	0.32	0.32	0.32	0.32
	SHGC[2]	0.28	0.17	0.25	0.16
	VT[3]	0.47	0.26	0.42	0.23
French Casement Windows Operating (56-1/2" x 71-7/8")	U-Factor[1]	0.32	0.32	0.32	0.32
	SHGC[2]	0.28	0.17	0.25	0.16
	VT[3]	0.47	0.26	0.42	0.23
Awning Windows Operating (48" x 24-1/8")	U-Factor[1]	0.31	0.32	0.31	0.32
	SHGC[2]	0.27	0.17	0.25	0.16
	VT[3]	0.47	0.26	0.42	0.23
Casement/Awning Picture Windows (up to 17 sq/ft.)	U-Factor[1]	0.31	0.31	0.31	0.31
	SHGC[2]	0.32	0.20	0.29	0.18
	VT[3]	0.55	0.31	0.49	0.28
Monumental Double-Hung Windows Aluminum Clad	U-Factor[1]	††	††	††	††
	SHGC[2]	††	††	††	††
	VT[3]	††	††	††	††
Specialty Windows Aluminum Clad (units up to 17 sq/ft.)	U-Factor[1]	0.30	0.31	0.30	0.31
	SHGC[2]	0.37	0.32	0.33	0.20
	VT[3]	0.64	0.36	0.57	0.32
Hinged Door–Inswing	U-Factor[1]	0.32	0.33	0.33	0.34
	SHGC[2]	0.22	0.14	0.20	0.13
	VT[3]	0.37	0.21	0.33	0.18
Hinged Door–Outswing	U-Factor[1]	0.32	0.32	0.33	0.33
	SHGC[2]	0.22	0.14	0.20	0.13
	VT[3]	0.37	0.21	0.33	0.18
Fixed Doors & Sidelights–Inswing	U-Factor[1]	0.35	0.35	0.35	0.35
	SHGC[2]	0.15	0.10	0.16	0.10
	VT[3]	0.24	0.14	0.25	0.14
Fixed Doors & Sidelights–Outswing	U-Factor[1]	0.34	0.34	0.34	0.34
	SHGC[2]	0.15	0.10	0.16	0.10
	VT[3]	0.18	0.14	0.25	0.14
Commercial Outswing Door	U-Factor[1]	0.32	0.32	0.33	0.33
	SHGC[2]	0.22	0.14	0.20	0.13
	VT[3]	0.37	0.21	0.33	0.18

Andersen® 200 Series Product Type		Without Grilles		With Grilles	
		Clear Dual-Pane	Low-E	Clear Dual-Pane	Low-E
Casement 24" x 48" size	U-Factor[1]	0.45	–	0.45	–
	SHGC[2]	0.60	–	0.55	–
	VT[3]	0.62	–	0.57	–
Awning 48" x 24" size	U-Factor[1]	0.45	–	0.45	–
	SHGC[2]	0.59	–	0.53	–
	VT[3]	0.61	–	0.55	–
Tilt-Wash Double-Hung 36" x 60" size	U-Factor[1]	0.47	0.33	0.49	0.34
	SHGC[2]	0.60	0.34	0.54	0.30
	VT[3]	0.63	0.55	0.56	0.49
Narroline® Double-Hung 36" x 60" size	U-Factor[1]	0.47	0.32	0.48	0.34
	SHGC[2]	0.60	0.34	0.53	0.30
	VT[3]	0.63	0.56	0.56	0.50
Narroline® Transom 48" x 48" size	U-Factor[1]	0.43	0.30	0.46	0.32
	SHGC[2]	0.63	0.35	0.57	0.32
	VT[3]	0.66	0.58	0.59	0.52
Gliding Window 60" x 36" size	U-Factor[1]	0.46	0.33	0.46	0.34
	SHGC[2]	0.54	0.30	0.49	0.27
	VT[3]	0.57	0.50	0.50	0.44
Fixed, Transom, Circle Top™ 48" x 48" size	U-Factor[1]	0.45	0.30	0.47	0.32
	SHGC[2]	0.61	0.34	0.55	0.31
	VT[3]	0.65	0.57	0.58	0.51
		Tempered w/o Grilles		Tempered w/ Grilles	
Narroline® Gliding Patio Door 72" x 82" size	U-Factor[1]	0.46	0.31	0.47	0.33
	SHGC[2]	0.61	0.34	0.53	0.30
	VT[3]	0.64	0.56	0.56	0.49
Perma-Shield® Gliding Patio Door 72" x 82" size	U-Factor[1]	0.45	0.31	0.46	0.32
	SHGC[2]	0.61	0.34	0.54	0.30
	VT[3]	0.64	0.57	0.56	0.50
Hinged Patio Door 72" x 82" size	U-Factor[1]	0.44	0.33	0.45	0.35
	SHGC[2]	0.45	0.26	0.39	0.22
	VT[3]	0.47	0.41	0.40	0.35

Please contact your Andersen supplier for performance values on products that include patterned glass, tempered glass other than skylights or roof windows and products ordered with capillary breather tubes.

†† = Information not available at time of printing. Contact your Andersen supplier for more information.

Grilles = Finelight or Full Divided light.

"High-Performance Low-E4" (HP Low-E4) and "High-Performance Low-E4 Sun" (HP Low-E4 Sun) are Andersen trademarks for "Low-E" glass.

1 U-Factor defines the amount of heat loss through the total unit in BTU/hr sq. ft².°F. The lower the value, the less heat is lost through the entire product.

2 Solar Heat Gain Coefficient (SHGC) defines the fraction of solar radiation admitted through the glass both directly transmitted and absorbed and subsequently released inward. The lower the value, the less heat is transmitted through the product.

3 Visible Transmittance (VT) measures how much light comes through a product (glass and frame). The higher the value, from 0 to 1, the more daylight the product lets in over the product's total unit area. Visible Transmittance is measured over the 380 to 760 nanometer portion of the solar spectrum.

This data is accurate as of October 17, 2007. Due to ongoing product changes, updated test results, or new industry standards, this data may change over time.

Performance Data

Energy Efficiency: Why should it be important to you?

Comfort

An energy-efficient product will make your home more comfortable. Whether lowering your heating costs or lowering your cooling costs, being able to sit next to your window in the winter or the summer, energy-efficient windows offer many advantages.

Lower Heating Costs

One of the best ways to lower your heating costs is to select an energy-efficient product. The amount of heat loss through a product is defined by its U-Factor. The lower the U-Factor, the less heat is lost through the product. The less heat that is lost through the product, the lower your heating costs.

Lower Cooling Costs

Looking to lower your cooling costs? Look at the product's Solar Heat Gain Coefficient (SHGC). This rating, on a scale of 0 to 1, tells you how much heat gain enters through the product. The lower the value, the less heat gain through the product into the room. The less heat gain, the lower your cooling costs.

Visible Light

Looking to maximize the amount of light that comes through the window, patio door or skylight? Look at the product's Visible Transmittance rating. The higher the rating, on a scale of 0 to 1, the more light enters the room through the whole product. This rating takes into account the non-glass portion of the product as well. Given the same type of glass, a product with a higher visible transmittance will let more light in through the window or door.

Where do you find these ratings? The NFRC label.

When comparing the energy efficiency of one product to the next, look for the NFRC label. The energy performance label, developed by the National Fenestration Rating Council (NFRC), improves the ability to make product-to-product comparisons of energy performance. Traditionally there were numerous methods of testing for energy performance, leading to confusion and inconsistency when comparing product energy performance. NFRC certification and labeling simplifies this process.

Importance of Whole Product Performance

Traditionally, energy performance information has focused on just the glass. The NFRC certification and labeling program tests, certifies and labels the performance of the entire product: glass, sash or panel and frame. While glass information can be helpful, always look for the NFRC label when comparing product-to-product energy performance.

Want simplicity in selecting an energy-efficient product in your area?

Look for products that bear the ENERGY STAR® logo. Products that are ENERGY STAR® compliant must meet stringent performance requirements in various regions of the country. ENERGY STAR® products save you money and help protect the environment.

Andersen is the first window and patio door manufacturer to be certified by Green Seal, the independent, nonprofit organization dedicated to protecting the environment by promoting the manufacture and sale of environmentally preferable consumer products.

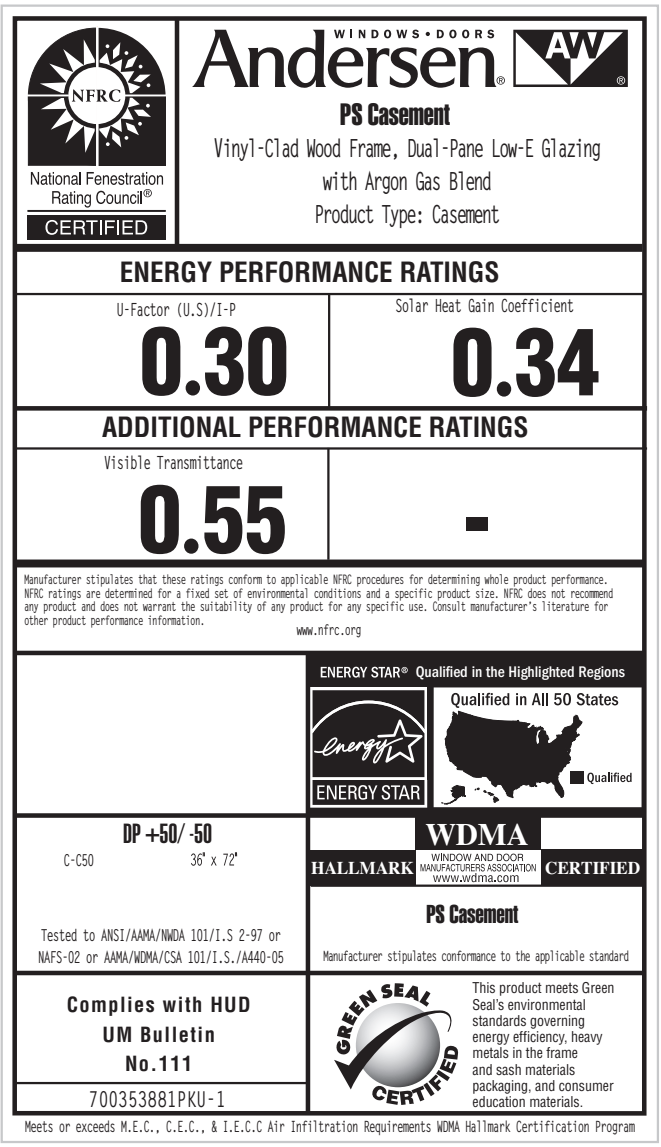
Please visit andersenwindows.com for specific product line qualifications.

About the NFRC.

The National Fenestration Rating Council (NFRC) is a nonpartisan coalition of professionals whose purpose is to provide fair, accurate and credible energy performance ratings for fenestration products. NFRC's membership includes manufacturers, suppliers, designers, specifiers, utility companies, government agencies and other building industry representatives.

The Andersen Corporation is a founding member of the NFRC and continues to support its work to provide fair, accurate and credible energy performance ratings to consumers and the building industry. If you have any questions about the NFRC, its program or energy performance ratings, write them at: NFRC, 1300 Spring Street, Suite 500, Silver Spring, MD 20910, Tel: (301) 589-6372 Website: www.nfrc.org

Want to better understand energy performance ratings?
Compare estimated annual energy costs from one product type to the next in your climate area?
Or just get information on the right type of product to look for in your area?
Visit the Efficient Windows Collaborative (EWC) website at:
www.efficientwindows.org or call them at: (202) 857-0666.



Efficient Duct Systems

Optimize the Home's Comfort Delivery System

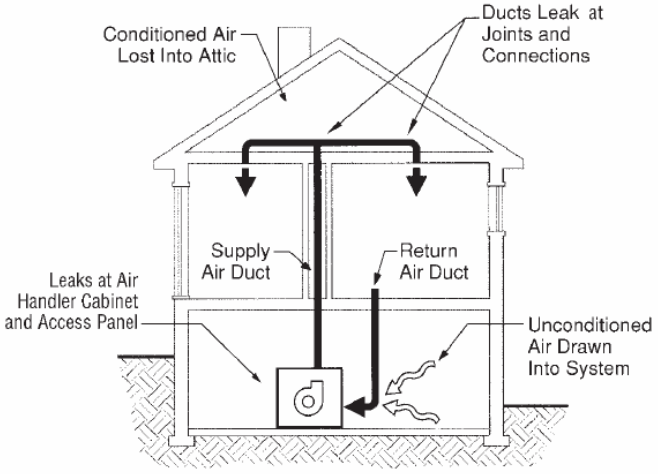
To create a comfortable home, an efficient duct system is a must. Ducts—known collectively as the air distribution system—carry air from the central heater or air conditioner to each part of the home and back again. In a typical house about 20 percent of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts. That's why the duct systems found in ENERGY STAR qualified homes are third-party tested for tightness and verified to be properly insulated.

BENEFITS OF EFFICIENT DUCT SYSTEMS

- **Improved Comfort.** When ducts are properly sealed and insulated, they deliver conditioned air more effectively to all rooms—helping to ensure a more constant temperature throughout the home.

- **Lower Utility Bills.** The average homeowner spends more than $600 on space heating and cooling each year. Tightly sealed and well insulated ducts found in ENERGY STAR qualified homes can reduce annual utility bills by $120 or more.

- **Improved Indoor Air Quality.** Leaky ducts in attics, unfinished basements, crawl spaces, and garages can allow dirt, dust, moisture, pollen, pests, and fumes to enter the home. Sealing these ducts helps improve indoor air quality.

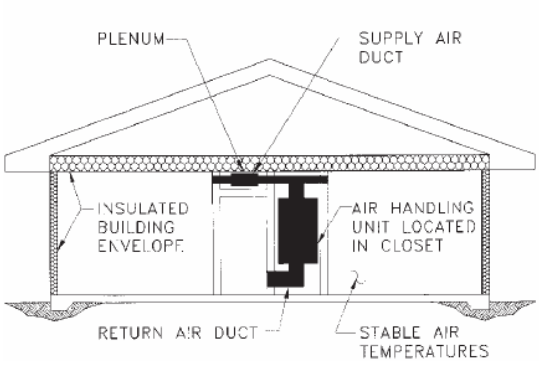


Typical Places Where Ducts Leak

- **Lower Equipment Costs.** When ducts are leaky, the heating and cooling system has to work harder to condition the home. Duct sealing, along with proper insulation, allows the installation of a smaller, less costly heating and cooling system.

BUILDING EFFICIENT DUCT SYSTEMS

Techniques and practices that provide an efficient and effective duct system include:



A Duct System Located in Conditioned Space

Ducts in Conditioned Spaces. Ducts operate more efficiently in conditioned air at room temperature. They do not work as well in excessively hot or cold attics and crawl spaces.

Sealed Ducts. EPA promotes the use of mastic and/or Underwriters Laboratory (UL) 181 approved tapes, such as metal-backed tape, to seal ducts. These materials more effectively seal leaks around duct joints and seams than standard "duct tape."

Insulated Ducts. Leaky ducts and poorly sealed connections can waste 20 percent or more of the air that you pay to heat and cool. To minimize this energy loss, EPA first recommends installing ducts in conditioned spaces. Where this is not possible, ducts should be insulated as recommended by the International Energy Conservation Code (IECC).

Right-Sized Ducts. Ducts in ENERGY STAR qualified homes are sized based on the Air Conditioning Contractors of America (ACCA) Manual J and Manual D calculations. This helps to ensure that the ducts accommodate the air flow requirements of the heating and cooling system for efficient distribution of heated or cooled air.

A BETTER FUTURE

ENERGY STAR is a voluntary partnership between the government and more than 9,000 organizations, including more than 3,500 of the nation's home builders. Together with home buyers and their families, we are working to achieve a common goal—protecting the environment for future generations by changing to more energy-efficient practices and products today.

ENERGY STAR is the government-backed symbol for energy efficiency. It identifies new homes, buildings, and more than 50 types of products that are energy efficient and offer the features, quality, and performance that today's consumers expect. Products that can earn the ENERGY STAR include windows, heating and cooling equipment, lighting, and appliances. To learn more about ENERGY STAR, visit www.energystar.gov.

Mechanical Ventilation

Breathe Easy with Fresh Air in the Home

Without mechanical ventilation to provide fresh air, moisture, odors, and other pollutants can build up inside a home. Mechanical ventilation systems circulate fresh air using ducts and fans, rather than relying on airflow through small holes or cracks in a home's walls, roof, or windows. Homeowners can breathe easier knowing their home has good ventilation.

BENEFITS OF MECHANICAL VENTILATION

- **Better Indoor Air Quality.** Indoor air can be many times more polluted than outdoor air, and the average American spends 90 percent of the day inside. Ventilation systems can significantly improve a home's air quality by removing allergens, pollutants, and moisture that can cause mold problems.

- **More Control.** When homes rely on air flow through walls, roofs, and windows for ventilation, there is no control over the source or amount of air that comes into the house. In fact, air leaking into the house may come from undesirable areas such as the garage, attic, or crawl space. Mechanical ventilation systems, however, provide proper fresh air flow along with appropriate locations for intake and exhaust.

- **Improved Comfort.** Mechanical ventilation systems allow a constant flow of outside air into the home and can also provide filtration, dehumidification, and conditioning of the incoming outside air.

HOW VENTILATION SYSTEMS WORK

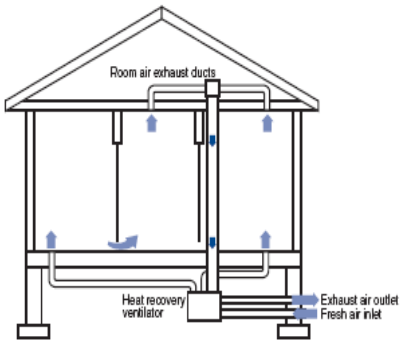
A variety of mechanical ventilation systems are available to select from, based on local climate and the home's heating and cooling system. In addition to one of the primary systems described below, "spot" ventilation fans should also be provided for kitchens and baths to remove the concentrated moisture and odors that can occur in these rooms. The typical systems and recommended climates are described below:

- **Supply Ventilation Systems—Hot or Mixed Climates.** Fresh air is drawn in through an air "intake" vent and distributed to many rooms by a fan and duct system. A fan and set of ducts dedicated solely to ventilation can be used, or an outside air intake can be connected to the main return air duct, allowing the heating and cooling system's fan and ducts to distribute the fresh air. The benefit of connecting to the return air duct is that outdoor air can be air conditioned or dehumidified before it is introduced into the home. Because supply systems continually introduce outdoor air, a home can become slightly pressurized. As a result, these systems are typically not appropriate for cold climates

where there is a risk of heated indoor air being pushed through any remaining holes and cracks in the construction assembly where it could reach cold exterior surfaces, condense, and cause moisture problems.

- **Exhaust Ventilation Systems—Cold Climates.** Indoor air is continuously exhausted to the outdoors with one or more fans often located in bathrooms. Because indoor air is continually drawn out, the home becomes slightly depressurized. As a result, these systems are typically not appropriate for hot, humid climates where there is a risk of drawing hot outdoor air into remaining holes and cracks in the construction assembly where it could reach cool interior surfaces, condense, and cause moisture problems.

- **Balanced Ventilation Systems—All Climates.** With these systems, equal quantities of air are brought into and sent out of the home. This is usually achieved using two fans—one to bring fresh air in and another to send indoor air out. The two most common systems are "heat recovery" ventilation (commonly referred to as HRV) and "energy recovery" ventilation (commonly referred to as ERV). HRVs transfer heat from exhaust air to incoming air during the heating season and from incoming air to exhaust air in the air conditioning season to reduce the heating and cooling load and improve comfort. ERVs transfer heat and moisture between the exhaust air and incoming air. This provides additional savings in the summer by reducing the moisture content of the incoming air that would otherwise have to be dehumidified with the cooling equipment or a dehumidifier. ERVs also provide additional comfort in the winter by adding moisture from the outgoing air to the incoming air to help avoid excessively dry indoor conditions.



A BETTER FUTURE

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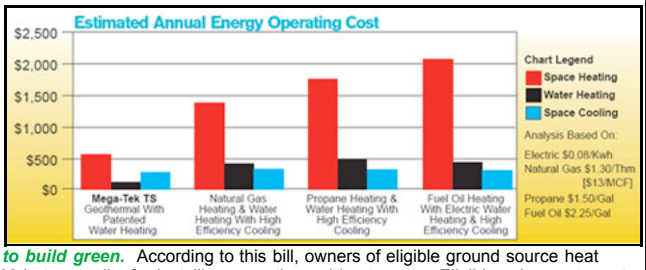
Residential Applications

Geothermal heat pumps are becoming a more popular choice for residential heating and cooling applications. By utilizing the efficiency of geothermal technology, residential applications can save tremendously on utility bills by converting or designing with ground-source or geothermal heat pumps. The technology means no unsightly noisy outdoor unit, greater cost savings than any other source of heating and more reliable and comfortable operation cost.

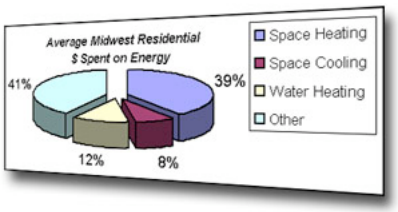
Geothermal Energy $avings

According to the Energy Information Administration (www.eia.doe.gov), between January 2003 and January 2006, the average price of natural gas rose from a meager $0.83 / Thm to an astounding $1.40 / Thm. Average U.S. Propane prices soared to record highs in 2006 to over $2.60 / gal, and Fuel Oil reached highs of over $2.50 / gal. What does all of this mean? Your heating and water heating bill grew just as quickly as the prices at the pumps, meaning you are paying more and more each month to heat your home. With geothermal technology, we free you from the always fluctuating fuel prices by relying on a more constant source of heat, the earth.

The figure to the right illustrates a case study of heating and cooling costs for similar homes with alternate sources of heating, cooling and water heating. The geothermal heat pump save tremendously as compared to even the highest efficiency gas or propane systems.



In August of 2005, the President signed an Energy Bill granting homeowners incentives to build green. According to this bill, owners of eligible ground source heat pump systems will receive up to $300 in tax credits for installing a geothermal heat pump. Eligible units must meet the following criteria: 14.1 EER & 3.3 COP for closed loop, 16.2 EER & 3.6 COP for open loop and the system must have a hot water "assist" (Desuperheater or On Demand Technology). Most HydroHeat geothermal heat pumps meet these stringent criteria.



According to the Energy Information Administration (reference link here) of the average home's utilities (heating, cooling, water heating, appliances, etc.) 59% is attributed to heating (39%), cooling (8%) and water heating (12%). With a **HydroHeat** geothermal heat pump system, you can save on all of these expenditures. Other geothermal heat pump manufacturers typically cannot cover the entire water heating usage with the heat pump as they will require gas or electricity to assist the heat pump in water heating mode. Read more about water heating below in the "Geothermal Water Heating" section.

What is the typical payback on a geothermal heat pump?
Although geothermal heat pumps may have a higher cost of installation, payback can be instantaneous when a home equity loan or construction loan is involved. If your existing system needs to be replaced, or if you are building a new home, a geothermal heat pump may offer you instant payback as well.

Below (table 1) is an typical amortization table. It helps calculate the monthly payment you can expect. To borrow $1,000 over 30 years at 5.75% will require approximately a $5.8357 payment per month to the lender. To borrow $8,000 (8 x $1,000) over 30 years at 5.75% will require approximately a $46.70 payment per month to the lender.

Table 1. Monthly Payment On Loan - $ Per Thousand Borrowed

% Rate	20 Years	25 Years	30 Years
5.000	6.5996	5.8459	5.3682
5.250	6.7384	5.9925	5.5220
5.500	6.8789	6.1409	5.6779
5.750	7.0208	6.2911	**5.8357**
6.000	7.1643	6.4430	5.9955
6.250	7.3093	6.5967	6.1572
6.500	7.4557	6.7521	6.3207
6.750	7.6036	6.9091	6.4860
7.000	7.7530	7.0678	6.6530

For a geothermal heat pump, the savings can exceed the cost of borrowing even when compared to the highest efficiency alternate system. Below (table 2.), we have compared the typical Propane Heating & Water Heating system with High Efficiency Cooling to a Mega-Tek TS Geothermal system with On-Demand Water Heating technology. Electric was assumed at $0.08/kWh and Propane at $1.50 per gallon - this home was located in the St. Louis, MO area.

Table 2. Geothermal Payback w/ Loan		High Efficiency Geothermal System Installation	Alternate High Efficiency Propane System Installation
A	Installation Cost:	$18,000	$8,000
B	Monthly Payment (on equity or construction loan @ $18,000, 30years, 5.75%):	- $105.04 per month	- $46.68 per month
C	Estimated ***Yearly*** Cost of Operation:	$949.42 per year	$2,625.00 per year
D	Estimated ***Monthly*** Cost of Operation (Heating, Water Heating & Cooling):	$79.16 per month	$218.75 per month
E	Geothermal ***Monthly*** Savings (Heating, Cooling, Water Heating vs. Alternate System):	***$139.63 per month***	N/A
F	Geothermal Income (Savings - loan Payment):	$34.59 per month	N/A

Table 2. can be summarized as follows: while the installation cost ***(A)*** may is higher for the geothermal system, the cost is not 100% upfront. Rather, the cost is periodic (monthly) to the lender in the amount of $105.04 per month

(B). In this example, the estimated yearly costs of operation for the geothermal and propane system (Heating, Water Heating and Cooling) are estimated at $949.42 and $2,625.00 respectively ***(C)***. At these estimated yearly operating costs, the monthly cost of operation would be $79.16 and $218.75 per month respectively for the geothermal system vs. the alternate Propane system ***(D)***. The monthly geothermal savings is therefore $218.75 - $79.16 = $139.63 per month ***(E)***.

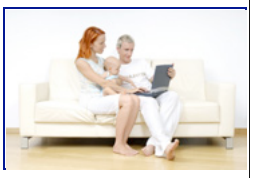
Conclusion: *If you are* ***paying $105.04 monthly to the lender****, but* ***receiving $139.63 per month in savings****, you have already achieved* ***instant payback*** *. . . you are actually generating $139.63 - $105.04 = $34.59 per month as income.*

The example in Table 2. illustrates an amazing, yet common tendency with geothermal heat pump systems. Whether the competitive source is Propane, Natural Gas, Electric (even air-source heat pump) or Fuel Oil, geothermal heat pumps can typically have instant payback.

Geothermal Water Heating

According to the Energy Information Administration (www.eia.doe.gov), 12% of the average mid-west households total utility expenditures (heating, air conditioning, water heating, lights and appliances, etc.) can be attributed to water heating alone. The HydroHeat product line offers unique "On Demand" technology that allows you to generate hot water and space heat and cool your house out of one appliance. Alternate brands may claim that they can do the same, but our patented technology can heat hot water even when the heat pump is not running to heat or cool your home, while others can't. This technology will qualify you for the 2005 Energy Bill Tax Credit (see above) and save you more than any Desuperheater option, guaranteed.

Geothermal Comfort



Geothermal heat pumps can offer increased comfort to your home. These appliances do not require any additional fuel source to heat your home / hot water. This means no: Carbon Monoxide potential, no allergies from combustibles and no outside air required for combustion. Geothermal heat pumps also circulate the air in the home more evenly, so temperature variance is less than conventional equipment. Compared to air-source heat pumps, geothermal heat pumps do not lose their ability to heat as the outdoor temperature drops. This results in greater comfort and piece of mind.

Geothermal Advantages

(1) *Hydro Delta Corporation is a pioneer* - we hold several exclusive geothermal patents and have the most advanced diagnostics available. We sell to qualified heat pump installing dealers nationwide and provide them with the tools to properly size, design, install and service your heat pump.
(2) *Profit* - ground-source heat pumps save you more money and will pay themselves off quicker than any other technology. New home financing can yield payback in 30 days with current fuel costs !
(3) *Tax Credits & Rebates* - local and federal $$ make your installation cost less and less, which increases payback
(4) *Ease of serviceability* - all acess panels are removable, unlike other heat pumps; this makes service and installation easier. Heat pumps are typically located indoors for more convenient acess as well.
(5) *Patented Technology* - patented On Demand Water Heating means greater savings and shorter payback
(6) *Green Machine* - the system is charged with refrigerant at the factory, which means less margin of error for installation and no refrigerant pollution
(7) *No Outside Unit* - all equipment is installed inside, this means less outside noise, and longer lifespan - custom noise insulation ensures quiet operation of your geothermal heat pump
(8) *Renewable Energy* - use the constant energy source of the earth to heat and cool for much less money than alternate fuels
(9) *Even Temperatures* - lower output temperature and longer run times mean more even heating and cooling throughout the home
(10) *No combustibles* - no open flames or CO generation in your home

ENERGY STAR Qualified Heating Equipment

Enhances Comfort and Improves Durability

During the winter, homeowners expect their heating systems to keep them warm without breaking the bank. ENERGY STAR qualified heating equipment can be up to 15 percent more efficient than standard models. ENERGY STAR qualified homes built in the North typically include right-sized ENERGY STAR qualified heating equipment.

BENEFITS OF ENERGY STAR QUALIFIED HEATING SYSTEMS

- **Lower Utility Bills.** ENERGY STAR qualified heating systems are designed to use less energy than standard systems. When properly installed, these heating systems can save money on utility bills.

- **Less Risk of Air Quality Problems.** ENERGY STAR qualified gas-fired boilers and furnaces are designed to reduce the risk of backdrafting dangerous carbon monoxide exhaust into the home.

- **Increased Durability.** Most ENERGY STAR qualified boilers, furnaces, and heat pumps employ advanced technologies and high quality components, often resulting in longer equipment life and longer warranties compared to standard models.

HOW BOILERS, FURNACES, AND HEAT PUMPS WORK

Builders of ENERGY STAR qualified homes choose energy-efficient heating systems based on available fuel choices and regional preferences. Common heating systems include boilers, furnaces, and heat pumps. Here's how they work:

- **Boilers** heat water that is distributed in pipes throughout the home to radiators, fan coil units, baseboard convection units, or radiant loops. ENERGY STAR qualified boilers use about 5 percent less energy than standard boilers.

- **Furnaces** heat air and distribute it throughout the home in a duct system. ENERGY STAR qualified oil and gas furnaces have annual fuel utilization efficiency (AFUE) ratings of 83 percent or higher, making them up to 15 percent more efficient than standard models.

- **Heat Pumps** use a refrigeration cycle to both heat and cool the home. In the summer, a heat pump functions exactly like an air conditioner—heat is extracted from inside the home and transferred to the outside. The resulting cooled and dehumidified air is distributed throughout the home in a duct system. In the winter, heat pumps operate in

reverse—by extracting heat from the air, the ground, or a source of water outdoors and transferring it to the indoor air, which is distributed throughout the home in a duct system.

ASK ABOUT INSTALLATION

Proper installation of heating equipment can have a big impact on performance. Look for heating equipment to be installed according to best practices, including:

- **Proper System Sizing.** Load calculations (from Manual J and Manual S of the Air Conditioning Contractors of America [ACCA]) should be used to determine heating requirements. These calculations are more accurate than rule-of-thumb estimating (for example, square footage ratios). In addition, ACCA Manual D should be used to properly size the duct system.

- **Proper Equipment Placement.** The best location for air-handling equipment and ducts is inside the conditioned space of the home (as opposed to an unconditioned garage or attic) to minimize exposure to harsh conditions (e.g., hot, humid, dusty attics in summer). Outdoor compressors should be positioned to minimize direct sun exposure while allowing plenty of room for air to flow around the units.

- **Correct Airflow.** The airflow and duct leakage should be tested and airflow adjusted as necessary to improve operating efficiency, comfort, and indoor air quality.

A BETTER FUTURE

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ENERGY STAR Qualified Cooling Equipment

Enhances Comfort and Improves Durability

Cooling costs can make up a large part of a home's energy bill, especially in the South. In fact, air conditioning can account for more than one-third of the energy used in an average southern home. ENERGY STAR qualified homes built in the South typically include right-sized ENERGY STAR qualified cooling equipment that lowers energy use, increases comfort, and improves durability.

BENEFITS OF ENERGY STAR QUALIFIED COOLING EQUIPMENT

- **Energy Savings.** Central air conditioners with the ENERGY STAR label have a higher Seasonal Energy Efficiency Ratio (SEER) than standard models. The higher the SEER, the greater the efficiency. ENERGY STAR qualified central air conditioners are approximately 8 percent more energy efficient than minimum standard equipment. Homeowners living in hot and humid climates can expect to save up to $700 in energy costs over the life of the ENERGY STAR qualified equipment.

- **Improved Comfort.** When properly sized and installed, an energy-efficient system supplies conditioned air more steadily over longer periods of time than an oversized unit. This results in more effective dehumidification and better mixing of conditioned air in the interior space.

- **Less Noise.** Many ENERGY STAR qualified air conditioning systems have variable speed fans, more insulation, and improved compressors that operate more quietly than standard models.

Maintenance Tips

- Hire a contractor to perform an annual pre-season check-up.
- Schedule a cooling check-up in the spring when contractors are more readily available.
- Clean or change air filters once a month.
- Use a programmable thermostat.

- **Reduced Maintenance.** Over-sized equipment typically results in "short cycling," (frequent on and off), which increases wear and tear and the need for future repairs. Right-sized ENERGY STAR qualified cooling equipment often uses higher quality components that can result in longer equipment life and longer warranties compared to standard models. Properly designed and installed ENERGY STAR qualified equipment can provide optimal performance with fewer problems down the road.

ASK ABOUT INSTALLATION

Proper installation of air conditioning equipment can have a big impact on performance. Look for cooling equipment to be installed according to best practices, which include:

- **Proper System Sizing.** Load calculations (from Manual J and Manual S of the Air Conditioning Contractors of America [ACCA]) should be used to determine air conditioning requirements. These calculations are more accurate than rule-of-thumb estimating (for example, square footage ratios). In addition, ACCA Manual D should be used to properly size the duct system.

- **Proper Equipment Placement.** The best location for air-handling equipment and ducts is inside the conditioned space of the home (as opposed to an unconditioned garage or attic) to minimize exposure to harsh conditions (e.g., hot, humid, dusty attics in summer). Outdoor compressors should be positioned to minimize direct sun exposure, while allowing plenty of room for air to flow around the units.

- **Proper Refrigerant Charge.** Once the system is installed, the refrigerant line should be checked to verify proper refrigerant charge. An incorrect amount of refrigerant can lower system efficiencies by up to 20 percent and ultimately lead to premature component failure.

- **Correct Airflow.** The airflow and duct leakage should be tested and airflow adjusted as necessary to improve operating efficiency, comfort, and indoor air quality.

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High Efficiency Water Heaters

Provide Hot Water for Less

Heating water accounts for approximately 15 percent of a home's energy use. High efficiency water heaters use 10 to 50 percent less energy than standard models, saving homeowners money on their utility bills. Actual energy savings from high efficiency water heaters depend on family size, heater location, and the size and placement of water pipes.

UNDERSTANDING HIGH EFFICIENCY WATER HEATER TECHNOLOGIES

- **Storage (Tank) Water Heaters.** Water is kept hot and ready for use at all times in insulated storage tanks with capacities ranging from 20 to 80 gallons. Many fuel options are available, including electricity, natural gas, oil, and propane. One drawback of these units is the energy used to keep the water hot at all times, otherwise known as "standby losses."

- **Demand (Tankless) Water Heaters.** Water circulated through a large coil is heated only on demand using gas or electricity; there is no storage tank continuously maintaining hot water. A possible concern with this technology is the limitation on the number of fixtures that can simultaneously use hot water. However, there is an endless supply of hot water and standby losses are eliminated.

Hot Water Usage
(based on national averages)
The typical U.S. homeowner's water consumption by place of use.

- **Heat Pump Water Heaters.** Heat pumps transfer energy from the surrounding air to water in a storage tank. These water heaters are much more efficient than electric resistance water heaters and most effective in warm climates with long cooling seasons.

- **Solar Water Heating.** While the initial purchase price of solar water heaters is high compared to standard models, they can be cost effective. That is because the sun's energy is harnessed to reduce operating costs up to 90 percent. Solar water heating systems require a conventional water heater as a backup water heating source to ensure hot water is available when solar energy is not.

Comparison of Water Heaters					
High Efficiency Water Heater Type	**Energy Savings vs. Minimum Standards**	**Best Climates**	**Expected Energy Savings Over Equipment Lifetime**	**Expected Lifetime**	**Major Advantages**
High Efficiency Storage (Tank) (Oil, Gas, Elec.)	10%–20%	Any	Up to $500	8–10 Years	Lowest first cost
Demand (Tankless) Using Gas or Elec.	45%–60%	Any	Up to $1,800	20 Years	Unlimited supply of hot water
Heat Pump	65% (Compared to electric resistance)	Mild-Hot	Up to $900	10 Years	Most efficient electric fuel option
Solar with Electric Back-Up	70%–90%	Mild-Hot	Up to $2,200	20 Years	Largest energy savings using a renewable energy source

IMPORTANT WATER HEATER METRICS

- **First-Hour Rating (FHR).** FHR measures how much hot water will be available during the busiest hour of the day. A large tank does not necessarily translate to a higher FHR. The recovery rating is important as it indicates the water heater's ability to replenish hot water as it is drawn from the tank.

- **Efficiency.** The water heater's efficiency is measured as an Energy Factor (EF), which is usually listed beside the EnergyGuide label. The higher the number, the more energy efficient the water heater.

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ENERGY STAR Qualified Lighting

Saves Money with Style

Choosing more efficient light bulbs or light fixtures can make a big difference on utility bills and for the environment. Replacing the five most frequently used light fixtures in a home with ENERGY STAR qualified lighting can save about $65 each year in energy costs.

BENEFITS OF ENERGY STAR QUALIFIED FIXTURES AND BULBS

- **Cost Savings.** An ENERGY STAR qualified compact fluorescent light bulb (CFL) uses about 75 percent less energy than a comparable standard incandescent bulb. Replacing a 60-watt incandescent with a 13-watt CFL can save more than $30 in energy costs over the life of the bulb.

- **Improved Safety.** ENERGY STAR qualified CFLs operate at less than 100°F and are safer than the halogen bulbs typically used in floor lamps or torchieres, which burn at 1,000°F. Halogen bulbs, when improperly handled, can cause burns and fires due to their high heat output.

- **Enhanced Comfort.** Compared to standard incandescent bulbs, ENERGY STAR qualified CFLs generate about 75 percent less heat. This means they are cool to the touch, help reduce home cooling costs, and keep homes more comfortable.

- **Durability.** ENERGY STAR qualified fixtures and bulbs meet strict guidelines for longevity. Pin-based fixtures must last 10,000 hours, about 10 times longer than standard. CFLs must last 6,000 hours. In addition, ENERGY STAR qualified fixtures come with a 2-year warranty—double the industry standard.

Purchasing Tips

- To save money on utility bills, use ENERGY STAR qualified lighting in **high traffic** areas such as kitchens, bathrooms, stairs, and hallways.
- Use ENERGY STAR qualified lighting in **hard-to-reach places** as these products last longer and do not need to be changed as often as conventional lighting.
- Choose **"warm"** color temperature bulbs (< 3200 degrees Kelvin), which are most comparable to incandescent light.
- Look for **lumens (light output)** on the product packaging to determine appropriate wattage. For example, most 60-watt incandescent bulbs provide around 800 lumens, so look for an equivalent amount of lumens when shopping for a comparable CFL.

ENERGY STAR ADVANCED LIGHTING PACKAGE

The ENERGY STAR Advanced Lighting Package (ALP) designation identifies homes equipped with a comprehensive set of ENERGY STAR qualified lighting fixtures. Because these energy-efficient fixtures come in many designs and types, homeowners have a wide range of choices to create the atmosphere they want for their home. Below are some examples of the cost savings that can be expected from ENERGY STAR qualified fixtures over 7 years—the average length of home ownership.

Expenditures	ENERGY STAR Qualified Fixture	Conventional Fixture[1]
Initial Investment	$50	$30
Energy Costs[2]	$22	$85
Bulb Replacement[2]	$0	$7
TOTAL COST	$72	$122

1. Conventional Fixture = 100 watts. ENERGY STAR Qualified Fixture = 26 watts.
2. Comparisons are based on a qualified fixture's pin-based bulb's lifetime of 10,000 hours (about 7 years with an average use of 3.5 hours per day) and an incandescent bulb's lifetime of 1,000 hours at $.085 per kWh, $0.50 per incandescent bulb.

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EPA
United States
Environmental Protection
Agency

ENERGY STAR Advanced Lighting Package

Taking Energy-Efficient Lighting to the Next Level

Lighting adds beauty and drama to a home. It can make a small room look open and airy or a large room appear cozy and inviting. Keeping a home filled with light, however, can require a significant amount of energy. The ENERGY STAR Advanced Lighting Package (ALP) helps reduce energy use. ALP complements the ENERGY STAR label for new homes by identifying homes equipped with a comprehensive set of ENERGY STAR qualified lighting fixtures and ceiling fans.

BENEFITS OF THE ADVANCED LIGHTING PACKAGE

- **Energy Cost Savings.** ENERGY STAR qualified lighting typically uses 75 percent less energy than standard incandescent bulbs. ENERGY STAR qualified ceiling fans with lights are about 50 percent more efficient than conventional fan/light units.

- **Improved Quality.** ENERGY STAR qualified lighting fixtures meet strict EPA guidelines for energy efficiency and produce warm, long-lasting light without slow starts or annoying flicker or hum.

- **Less Time on a Ladder.** The bulbs in ENERGY STAR qualified fixtures and ceiling fan light kits can last up to 10 times longer than standard bulbs, which means homeowners change bulbs less frequently.

- **Enhanced Comfort**. ENERGY STAR qualified lighting generates about 75 percent less heat than standard incandescent lighting, which translates into reduced home cooling costs and added comfort during the summer months.

- **Environmental Protection.** Power plants generate the energy that powers most homes. Lowering energy use at home helps prevent greenhouse gas emissions and air pollutants at the source.

FEATURES OF THE ADVANCED LIGHTING PACKAGE

To receive the ALP designation, a home must include ENERGY STAR qualified lighting fixtures for:

- 50 percent of the total fixtures in high-use rooms, such as the family room or kitchen;
- 25 percent of the total fixtures in medium or low-use rooms, such as the office or bedroom; and
- 50 percent of the total number of outdoor fixtures, excluding landscape lighting.
- In addition, 100 percent of the ceiling fans must be ENERGY STAR qualified. ENERGY STAR qualified light kits in ceiling fans can be counted toward the fixture requirement. (Ventilation fans in bathrooms do not need to be labeled.)

Below is a summary of the projected savings associated with ALP at different electricity prices.

Potential Savings from the ENERGY STAR Advanced Lighting Package					
Electricity price per kilowatt hour (in dollar-cents)	$0.12½	$0.10½	$0.8½	$0.7½	$0.6½
Number of fixtures replaced with ENERGY STAR qualified fixtures in the home	6–22	6–22	6–22	6–22	6–22
Total annual electricity and bulb replacement savings realized (in dollars)	$48–$177	$41–$150	$33–$122	$30–$108	$26–$94
Total savings over 8 years* (in dollars)	$283–$1,038	$223–$817	$163–$596	$133–$486	$102–$396

*For more information, please visit the ENERGY STAR ® ADVANCED LIGHTING PACKAGE SAVINGS LOOK-UP TOOL

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EPA
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ENERGY STAR Qualified Appliances

Save Energy through Advanced Technologies

Every appliance comes with two price tags: what it costs to take it home and what it costs to operate and maintain it each month. ENERGY STAR qualified appliances incorporate advanced technologies and use 10 to 50 percent less energy than standard appliances. From refrigerators to clothes washers, ENERGY STAR qualified appliances save energy, save money, and help reduce emissions of greenhouse gases and air pollutants at the source.

BENEFITS OF ENERGY STAR QUALIFIED APPLIANCES

- **Lower Utility Bills.** Appliances account for nearly 20 percent of the average household's energy use. A comprehensive package of ENERGY STAR qualified appliances can save up to $80 a year in energy costs compared to standard appliances.

- **Improved Quality and Durability.** Energy-efficient appliances often include quality components surpassing those found in standard appliances. These can result in fewer mechanical problems, longer equipment life, and in many cases extended warranties.

- **Enhanced Performance.** ENERGY STAR qualified appliances often outperform standard appliances due to improved design and advanced technologies. For instance, some ENERGY STAR qualified appliances include features that decrease operating noise, while others include technologies that reduce water use.

OVERVIEW OF ENERGY STAR QUALIFIED APPLIANCES

REFRIGERATORS AND FREEZERS

ENERGY STAR qualified refrigerators use up to 40 percent less energy than the conventional models sold in 2001 and at least 15 percent less energy than models built to current federal standards. These refrigerators feature high-efficiency compressors, improved insulation, and more precise temperature and defrost mechanisms. ENERGY STAR qualified freezers use at least 10 percent less energy than required by current federal standards.

TIP: Leave space between the refrigerator and walls to allow air movement and brush (or vacuum) refrigerator or freezer coils regularly to maintain efficient operation.

DISHWASHERS

ENERGY STAR qualified dishwashers use at least 41 percent less energy than the federal minimum standard for energy consumption. These dishwashers use "smart" features such as effective washing action, energy-efficient motors, and sensors that determine the necessary cycle length and water temperature.

TIP: Use short wash cycles for everything but the dirtiest dishes.

CLOTHES WASHERS

ENERGY STAR qualified clothes washers use 40 to 50 percent less energy and about 55 percent less water than standard washers. As a result, you can expect to save up to $50 per year on utility and water bills, with additional savings from using less detergent. Most ENERGY STAR qualified washers extract more water during the spin cycle, providing further energy savings when using a clothes dryer because drying time will be shorter. Also, owners will see less wear and tear on clothes from front loading models, which do not need an agitator.

TIP: Use the correct amount and type of detergent; too many bubbles will make the machine work harder than necessary.

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Appendix C - Business

Lender	Location
Accord Financial Inc.	Clayton
American Heritage Mortgage Co. LLC	St. Louis
Bank of America	St. Louis
Coral Mortgage Bankers Corporation	St. Louis
Fifth Third Bank	St. Louis
First National Bank St. Louis	St. Louis
Peoples National Bank	St. Louis
Royal Banks of Missouri	St. Louis
The Business Bank of St. Louis	Clayton

C-Energy Star Life Cycle Cost Estimates

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Compact Fluorescent Lamp(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of units	1
Electricity Rate ($/kWh)	$ 0.097
Hours used per day	3

	ENERGY STAR Qualified Unit	Conventional Unit
Initial cost per unit (estimated retail price)	$3.50	$0.50
Wattage (watts)	15 *	60
Lifetime (hours)	10,000	1,000

**ENERGY STAR wattage is calculated based on the wattage selected for the incandescent unit, user can enter an alternative value if desired.*

Annual and Life Cycle Costs and Savings for 1 CFLs

	1 ENERGY STAR Qualified Units	1 Conventional Units	Savings with ENERGY STAR
Annual Operating Costs*			
Energy cost	$2	$6	$5
Maintenance cost	$0	$4	$4
Total	$2	$10	$9
Life Cycle Costs*			
Operating cost (energy and maintenance)	$12	$77	$65
Energy costs (lifetime)	$12	$48	$36
Maintenance costs (lifetime)	$0	$29	$29
Purchase price for 1 unit(s)	$3.50	$0.50	-$3.00
Total	$15	$77	$62
Simple payback of initial additional cost (years)†			0.3

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for 1 CFLs

Initial cost difference	$3
Life cycle savings	$65
Net life cycle savings (life cycle savings - additional cost)	$62
Simple payback of additional cost (years)	0.3
Life cycle energy saved (kWh)	450
Life cycle air pollution reduction (lbs of CO_2)	691
Air pollution reduction equivalence (number of cars removed from the road for a year)	0.06
Air pollution reduction equivalence (acres of forest)	0.09
Savings as a percent of retail price	1767%

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www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Programmable Thermostat(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of Units	1
Initial Cost per ENERGY STAR Unit (retail price)	$92
Initial Cost per Conventional Unit (retail price)	$73
Unit Fuel Cost (Cooling) ($/kWh)	$0.097
Unit Fuel Cost (Heating) ($/Therm)	$1.34

Choose your city from the drop-down menu

City: MO-St. Louis

24 Hour Typical Usage Patterns*

	Weekday	Weekend
Nighttime Set-Back/Set-Up Hours	8	8
Daytime Set-Back/Set-Up Hours	10	10
Hours without Set-Back/Set-Up	6	6

Heating Season*

Typical Indoor Temperature w/o Set-Back	70
Nighttime Set-Back Temperature (Average)	62
Daytime Set-Back Temperature (Average)	62
Heating System Type	Gas Furnace

Cooling Season*

Typical Indoor Temperature w/o Set-Up	78
Nighttime Set-Up Temperature (Average)	82
Daytime Set-Up Temperature (Average)	85
Cooling System Type	Central AC

**All temperatures are in degrees Fahrenheit. Setpoint is defined as the temperature setting for any given time period. Set-back temperature is defined as the lower setpoint temperature for the energy-savings periods during the heating season, generally nighttime and daytime. Set-up temperature is defined as the higher setpoint temperature for the energy-savings periods during the cooling season, generally nighttime and daytime.*

Annual and Life Cycle Costs and Savings for 1 Programmable Thermostat(s)

	1 ENERGY STAR Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Energy Costs			
Heating Energy Cost	$691	$843	$152
Heating Energy Consumption (MBTU)	51	63	11
Cooling Energy Cost	$174	$234	$60
Cooling Energy Consumption (MBTU)	6.1	8.2	2
Total	$865	$1,077	$211
Life Cycle Costs			
Energy Costs	$9,622	$11,972	$2,350
Heating Energy Costs	$7,683	$9,369	$1,686
Heating Energy Consumption (MBTU)	772	942	170
Cooling Energy Costs	$1,939	$2,602	$664
Cooling Energy Consumption (MBTU)	92	123	31
Purchase Price for 1 Unit(s)	$92	$73	-$19
Total	$9,714	$12,045	$2,331
		Simple payback of initial cost (years)	0.1

Summary of Benefits for 1 Programmable Thermostat(s)

Initial cost difference	$19
Life cycle savings	$2,350
Net life cycle savings (life cycle savings - additional cost)	$2,331
Life cycle energy saved (MBTU)-includes both Heating and Cooling	201
Simple payback of additional cost (years)	0.1
Life cycle air pollution reduction (lbs of CO_2)	29,057
Air pollution reduction equivalence (number of cars removed from the road for a year)	3
Air pollution reduction equivalence (acres of forest)	4
Savings as a percent of retail price	2534%

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Residential Refrigerator(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of units	1
Electricity Rate ($/kWh)	$ 0.097
Choose the type of refrigerator	1-Manual Defrost Refrigerators

	ENERGY STAR Qualified Unit	Conventional Unit
Initial cost per unit (estimated retail price)	$1,100	$1,070
Refrigerator Fresh Volume (ft^3)	18	18
Refrigerator Freezer Volume (ft^3)	5	5
Refrigerator Total Volume (ft^3)	23	23

Annual and Life Cycle Costs and Savings for 1 Residential Refrigerator(s)

	1 ENERGY STAR Qualified Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Operating Costs*			
Energy costs	$40	$46	$7
Total	$40	$46	$7
Life Cycle Costs*			
Energy costs	$395	$464	$70
Energy consumption (kWh)	5,293	6,228	934
Purchase Price for 1 unit(s)	$1,100	$1,070	-$30
Total	$1,495	$1,534	$40
Simple payback of initial additional cost (years)†			4.3

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for 1 Residential Refrigerator(s)

Initial cost difference	$30
Life cycle savings	$70
Net life cycle savings (life cycle savings - additional cost)	$40
Simple payback of additional cost (years)	4.3
Life cycle energy saved (kWh)	934
Life cycle air pollution reduction (lbs of CO_2)	1,434
Air pollution reduction equivalence (number of cars removed from the road for a year)	0.13
Air pollution reduction equivalence (acres of forest)	0.18
Savings as a percent of retail price	4%

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Residential Freezer(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of units	1	
Electricity Rate ($/kWh)	$0.097	
Choose the type of freezer	Upright Freezers with Automatic Defrost	
	ENERGY STAR Qualified Unit	Conventional Unit
Initial cost per unit (estimated retail price)	$362	$329
Freezer Volume (ft^3)	22	22

Annual and Life Cycle Costs and Savings for 1 Residential Freezer(s)

	1 ENERGY STAR Qualified Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Operating Costs*			
Energy costs	$70	$78	$8
Total	$70	$78	$8
Life Cycle Costs*			
Energy costs	$612	$680	$68
Purchase price for 1 unit(s)	$362	$329	-$33
Total	$974	$1,009	$35
Simple payback of initial additional cost (years)†			4.3

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for 1 Residential Freezer(s)

Initial cost difference	$33
Life cycle savings	$68
Net life cycle savings (life cycle savings - additional cost)	$35
Simple payback of additional cost (years)	4.3
Life cycle energy saved (kWh)	879
Life cycle air pollution reduction (lbs of CO_2)	1,349
Air pollution reduction equivalence (number of cars removed from the road for a year)	0.12
Air pollution reduction equivalence (acres of forest)	0.17
Savings as a percent of retail price	10%

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
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CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Ceiling Fan(s) with Lighting

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of units	1
Electricity Rate ($/kWh)	$0.097
Percent of Time Spent at Low Speed	40%
Percent of Time Spent at Medium Speed	40%
Percent of Time Spent at High Speed	20%

Choose your location from the drop-down menu: National Average

	ENERGY STAR Qualified Unit	Conventional Unit
Initial Cost per Unit (estimated retail price)	$276	$190
Cost per Replacement Bulb	$3.50	$0.50
Number of Bulbs per Fixture	3	3
Wattage per Bulb	20	60

Annual and Life Cycle Costs and Savings for 1 Ceiling Fan(s) with Lighting

	1 ENERGY STAR Qualified Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Operating Costs*			
Energy cost	$14	$29	$15
Maintenance cost	$2	$13	$10
Total	$16	$41	$25
Life Cycle Costs*			
Operating costs (energy and maintenance)	$132	$335	$203
Energy cost	$113	$232	$119
Maintenance cost	$19	$103	$84
Purchase price for 1 unit(s)	$276	$190	-$86
Total	$408	$525	$117
Simple payback of initial additional cost (years)†			3.4

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for 1 Ceiling Fan(s) with Lighting

Initial cost difference	$86
Life cycle savings	$203
Net life cycle savings (life cycle savings - additional cost)	$117
Simple payback of additional cost (years)	3.4
Life cycle energy saved (kWh)	1,513
Life cycle air pollution reduction (lbs of CO_2)	2,322
Air pollution reduction equivalence (number of cars removed from the road for a year)	0.2
Air pollution reduction equivalence (acres of forest)	0.3
Savings as a percent of retail price	42%

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Residential Clothes Washer(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Choose the type of washing machine	Residential	
Number of units	1	
Electric Rate ($/kWh)	$0.097	
Water Rate ($/1000 gallons)	$4.529	
Gas Rate ($/therms)	$1.342	
Average Number of Loads per Week	7.5	
Type of Water Heating	Gas Water Heating	
	ENERGY STAR Qualified Unit	Conventional Unit
Initial Cost per Unit (estimated retail price)	$500	$300

Annual and Life Cycle Costs and Savings for 1 Residential Clothes Washer(s)

	1 ENERGY STAR Qualified Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Operating Costs*			
Electricity costs	5.45	7.96	2.50
Water costs	26.22	57.83	31.60
Gas costs	27.79	39.60	11.81
Maintenance costs	0.00	0.00	0.00
Total	$59	$105	$46
Life Cycle Costs*			
Operating costs (electricity, water, and maintenance)	520.93	923.21	402.28
Electricity costs	47.79	69.72	21.94
Water costs	229.73	506.59	276.86
Gas costs	243.42	346.90	103.48
Maintenance costs	0.00	0.00	0.00
Purchase price for 1 unit(s)	500.00	300.00	-200.00
Total	1020.93	1223.21	202.28
Simple payback of initial additional cost (years)†			4.4

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for 1 Residential Clothes Washer(s)

Initial cost difference	$200.00
Life cycle savings	$402.28
Net life cycle savings (life cycle savings - additional cost)	$202.28
Simple payback of additional cost (years)	4.36
Life cycle electricity saved (kWh)	283.80
Life cycle air pollution reduction (lbs of CO_2)	435.63
Air pollution reduction equivalence (number of cars removed from the road for a year)	0.04
Air pollution reduction equivalence (acres of forest)	0.05
Savings as a percent of retail price	40%

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for an ENERGY STAR Qualified Gas Residential Furnace

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

What fuel do you use to heat your home?	Gas	
Gas Rate ($/therm)	$1.17	
What Census region do you live in?	ST. LOUIS, MO	
How large is your home? (in square feet)	1,550	Include only heated space
When was your home built?	2000-Present	
When was your existing furnace installed?	New Unit	Select 'New Unit' to compare new furnace options

	New ENERGY STAR Qualified Unit	Conventional or Existing Unit	
Installed Cost per Unit (estimated retail price)	$1,100	$780	
Annual Fuel Utilization Efficiency (AFUE)	90%	78%	
Use with programmable Thermostat (Yes/No)	Yes	No	Thermostat Usage Guidelines

You have selected the programmable thermostate option, your savings are calculated based on ENERGY STAR suggested thermostat usage shown in the link above, your actual savings may vary.

Annual and Life Cycle Costs and Savings for a Gas Furnace

	ENERGY STAR Qualified Unit	Conventional Unit	Savings with ENERGY STAR
Annual Operating Costs*			
Energy cost	$295	$440	$145
Energy Consumption (MMBTU)	25	38	12
Energy Consumption (Therms)	252	376	124
Maintenance cost	$0	$0	$0
Total	$295	$440	$145
Life Cycle Costs*			
Operating costs (energy and maintenance)	$3,736	$5,569	$1,833
Energy costs	$3,736	$5,569	$1,833
Maintenance costs	$0	$0	$0
Purchase price	$1,100	$780	-$320
Total	$4,836	$6,349	$1,513
Simple payback of initial additional cost (years)†			2.2

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for a Gas Furnace

Initial cost difference	$320
Life cycle savings	$1,833
Net life cycle savings (life cycle savings - additional cost)	$1,513
Simple payback of additional cost (years)	2.2
Life cycle energy saved (MMBtu)	223
Life cycle air pollution reduction (lbs of CO_2)	26,026
Air pollution reduction equivalence (number of cars removed from the road for a year)	2
Air pollution reduction equivalence (acres of forest)	3
Savings as a percent of retail price	138%

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for an ENERGY STAR Qualified Boiler

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

What fuel do you use to heat your home?	Gas	
Gas Rate ($/therm)	$1.34	
Select the city you live in, or closest to?	ST. LOUIS, MO	
How large is your home? (in square feet)	1,550	Include only heated space
When was your home built?	2000-Present	
When was your existing boiler installed?	New Unit	Select 'New Unit' to compare new boiler options

	ENERGY STAR Qualified Unit	Conventional Unit	
Initial Cost per Unit (estimated retail price)	$5,500	$4,600	
Annual Fuel Utilization Efficiency (AFUE)	85%	80%	
Use with Programmable Thermostat (Yes/No)	Yes	No	Thermostat Usage Guidelines

You have selected the programmable thermostate option, your savings are calculated based on ENERGY STAR suggested thermostat usage, your actual savings may vary.

Annual and Life Cycle Costs and Savings for a Gas Boiler

	ENERGY STAR Qualified Unit(s)	Conventional Unit(s)	Savings with ENERGY STAR
Annual Operating Costs*			
Energy cost	$438	$583	$144
Energy Consumption (MMBTU)	33	43	11
Energy Consumption (therms)	326	434	108
Maintenance cost	$0	$0	$0
Total	$438	$583	$144
Life Cycle Costs*			
Operating costs (energy and maintenance)	$5,956	$7,917	$1,961
Energy costs	$5,956	$7,917	$1,961
Maintenance costs	$0	$0	$0
Purchase price	$5,500	$4,600	-$900
Total	$11,456	$12,517	$1,061
Simple payback of initial additional cost (years)†			6.2

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for a Gas Boiler

Initial cost difference	$900
Life cycle savings	$1,961
Net life cycle savings (life cycle savings - additional cost)	$1,061
Simple payback of additional cost (years)	6.2
Life cycle energy saved (MMBtu)	215
Life cycle air pollution reduction (lbs of CO_2)	25,153
Air pollution reduction equivalence (number of cars removed from the road for a year)	2
Air pollution reduction equivalence (acres of forest)	3
Savings as a percent of retail price	19%

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Air Source Heat Pump(s)

This simple energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors. For a more sophisticated estimate, use the ENERGY STAR HVAC Investor software or a bin-hour tool.

Enter your own values in the gray boxes or use our default values.

Number of units	1	
Electric Rate ($/kWh)	$0.097	
City		
Choose your city from the drop-down menu	MO-St. Louis	
	ENERGY STAR Qualified Unit	Conventional Unit
Initial Cost per Unit (estimated retail price)	$6,700	$5,700
Heating Seasonal Performance Factor (HSPF) rating	8.2	7.7
Seasonal Energy Efficiency Ratio (SEER) rating	14	13
Heat Pump Capacity (Btu/hr)	36,000	36,000
Use with programmable thermostat (Yes/No)	Yes	No

Annual and Life Cycle Costs and Savings for 1 Air Source Heat Pump(s)

	1 ENERGY STAR Qualified Units	1 Conventional Units	Savings with ENERGY STAR
Annual Operating Costs*			
Energy cost	$967	$1,238	$271
Energy consumption (kWh)	9,962	12,757	2,796
Maintenance cost	$0	$0	$0
Total	$967	$1,238	$271
Life Cycle Costs*			
Operating costs (energy and maintenance)	$9,074	$11,621	$2,547
Energy costs	$9,074	$11,621	$2,547
Maintenance costs	$0	$0	$0
Purchase price for 1 unit(s)	$6,700	$5,700	-$1,000
Total	$15,774	$17,321	$1,547
		Simple payback of initial additional cost (years)†	3.7

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for 1 Air Source Heat Pump(s)

Initial cost difference	$1,000
Life cycle savings	$2,547
Net life cycle savings (life cycle savings - additional cost)	$1,547
Simple payback of additional cost (years)	3.7
Life cycle energy saved (kWh)	33,550
Life cycle air pollution reduction (lbs of CO_2)	51,499
Air pollution reduction equivalence (number of cars removed from the road for a year)	4
Air pollution reduction equivalence (acres of forest)	6
Savings as a percent of retail price	23%

Median and Average Price per Square Foot of Floor Area in New One-Family Houses Sold by Location

(Price per square foot of floor area excludes value of improved lot. Medians and averages computed from unrounded figures)

	Median price per square foot							Average price per square foot						
				Region							Region			
Year	United States	Inside MSAs	Outside MSAs	North-east	Midwest	South	West	United States	Inside MSAs	Outside MSAs	North-east	Midwest	South	West
1992	$52.31	$52.67	$49.73	$63.28	$54.44	$46.21	$57.87	$55.18	$55.61	$51.79	$66.46	$59.65	$48.49	$61.64
1993	$55.05	$55.12	$54.33	$63.01	$59.17	$48.50	$60.28	$57.41	$57.65	$55.14	$65.93	$60.41	$50.98	$63.86
1994	$57.33	$57.36	$56.72	$63.75	$62.10	$50.71	$62.35	$60.21	$60.46	$58.03	$67.84	$63.91	$53.16	$67.08
1995	$59.02	$59.11	$58.76	$65.40	$65.00	$52.57	$63.89	$62.45	$62.75	$59.88	$70.68	$66.43	$56.14	$68.21
1996	$61.56	$61.67	$60.95	$67.33	$66.24	$54.73	$67.57	$64.38	$64.63	$62.10	$71.66	$67.47	$56.75	$72.51
1997	$63.40	$63.57	$61.71	$70.17	$68.49	$56.30	$69.31	$66.81	$67.31	$61.75	$76.23	$69.49	$58.45	$75.30
1998	$64.51	$64.83	$62.72	$73.09	$70.30	$57.44	$68.37	$67.83	$68.26	$63.80	$79.04	$71.38	$59.99	$74.45
1999	$63.66	$63.66	$63.40	$72.10	$69.84	$57.40	$68.07	$67.70	$68.01	$64.78	$77.21	$71.46	$60.11	$74.49
2000	$65.59	$65.50	$66.25	$75.55	$73.43	$58.51	$72.28	$70.43	$70.62	$68.76	$83.60	$74.61	$61.38	$79.93
2001	$67.21	$67.21	$67.17	$79.04	$74.89	$60.43	$75.38	$71.93	$72.06	$70.90	$85.58	$75.59	$62.92	$82.77
2002	$70.39	$70.65	$69.05	$84.40	$76.52	$63.31	$82.56	$75.68	$76.07	$72.53	$88.58	$77.95	$65.54	$89.31
2003	$73.07	$73.55	$70.67	$90.51	$80.71	$64.80	$85.95	$79.21	$79.91	$74.79	$96.74	$83.01	$68.25	$93.43
2004	$78.90	$78.42	$80.64	$100.33	$85.52	$67.61	$93.68	$85.13	$85.57	$82.47	$106.92	$86.82	$72.50	$102.26
2005	$83.61	$83.44	$84.96	$110.49	$87.32	$72.03	$106.29	$90.63	$90.63	$90.63	$114.28	$88.64	$77.96	$114.45
2006	$85.44	$85.77	$83.12	$110.05	$86.96	$75.36	$111.86	$91.99	$92.38	$87.61	$117.76	$89.58	$80.32	$120.66
2007	$84.71	$84.72	$85.21	$108.36	$84.95	$77.36	$108.30	$92.51	$92.74	$89.59	$116.98	$88.01	$82.48	$121.78
RSE	3	3	4	8	6	4	2	2	2	5	8	5	3	4

A Represents an RSE that is greater than or equal to 100 or could not be computed.
NA Not available. RSE Relative Standard Error.
S Withheld because estimate did not meet publication standards on the basis of response rate, associated standard error, or a consistency review.

Note: Data for 1992 through 1999 have been recomputed using a revised tabulation methodology.

Median and Average Square Feet of Floor Area in New One-Family Houses Sold by Location

(Medians and averages computed from unrounded figures)

	Median square feet							Average square feet						
				Region							Region			
Year	United States	Inside MSAs	Outside MSAs	North-east	Midwest	South	West	United States	Inside MSAs	Outside MSAs	North-east	Midwest	South	West
1978	1,650	1,710	1,420	1,730	1,590	1,700	1,600	1,750	1,810	1,510	1,800	1,700	1,800	1,700
1979	1,650	1,710	1,390	1,770	1,600	1,670	1,600	1,760	1,820	1,480	1,830	1,710	1,790	1,700
1980	1,570	1,630	1,330	1,670	1,470	1,600	1,510	1,700	1,760	1,410	1,810	1,640	1,730	1,640
1981	1,560	1,650	1,270	1,800	1,390	1,570	1,540	1,710	1,790	1,390	1,880	1,640	1,730	1,660
1982	1,530	1,570	1,290	1,720	1,440	1,520	1,530	1,690	1,730	1,440	1,830	1,670	1,690	1,640
1983	1,580	1,610	1,390	1,670	1,680	1,580	1,530	1,740	1,770	1,470	1,820	1,880	1,740	1,630
1984	1,610	1,640	1,380	1,670	1,690	1,590	1,570	1,790	1,830	1,470	1,910	1,900	1,760	1,720
1985	1,590	1,620	1,330	1,640	1,610	1,590	1,580	1,760	1,790	1,480	1,830	1,780	1,750	1,710
1986	1,650	1,680	1,370	1,760	1,640	1,660	1,600	1,810	1,840	1,490	1,890	1,810	1,820	1,740
1987	1,760	1,780	1,510	1,810	1,720	1,780	1,730	1,900	1,920	1,630	1,920	1,880	1,930	1,850
1988	1,800	1,820	1,500	1,730	1,760	1,800	1,820	1,960	1,990	1,670	1,950	1,910	1,990	1,960
1989	1,860	1,900	1,440	1,840	1,820	1,830	1,900	2,000	2,050	1,600	1,990	1,960	2,010	2,020
1990	1,890	1,940	1,460	1,910	1,820	1,890	1,910	2,050	2,100	1,650	2,080	1,960	2,070	2,060
1991	1,900	1,960	1,450	2,000	1,810	1,890	1,940	2,050	2,100	1,600	2,110	1,960	2,060	2,080
1992	1,900	1,940	1,520	2,000	1,800	1,950	1,830	2,060	2,100	1,670	2,100	1,970	2,120	2,000
1993	1,900	1,950	1,550	2,000	1,800	2,000	1,810	2,060	2,100	1,670	2,120	1,960	2,140	1,990
1994	1,900	1,940	1,530	2,020	1,800	1,970	1,810	2,050	2,090	1,660	2,210	1,950	2,110	1,960
1995	1,880	1,940	1,570	2,080	1,800	1,980	1,790	2,050	2,090	1,650	2,190	1,940	2,130	1,950
1996	1,940	1,970	1,620	2,100	1,830	1,990	1,860	2,090	2,120	1,740	2,290	1,970	2,140	2,020
1997	1,960	2,000	1,620	2,120	1,890	2,000	1,900	2,140	2,170	1,760	2,280	2,050	2,170	2,090
1998	2,000	2,040	1,610	2,130	1,930	2,020	1,950	2,170	2,210	1,750	2,310	2,070	2,210	2,120
1999	2,033	2,082	1,667	2,204	1,935	2,087	1,977	2,221	2,263	1,806	2,340	2,097	2,278	2,178
2000	2,077	2,127	1,729	2,323	1,982	2,092	2,042	2,265	2,308	1,846	2,469	2,148	2,287	2,245
2001	2,099	2,136	1,794	2,301	1,936	2,137	2,062	2,282	2,321	1,925	2,486	2,144	2,309	2,272
2002	2,134	2,171	1,805	2,323	1,946	2,158	2,166	2,301	2,344	1,923	2,487	2,132	2,324	2,333
2003	2,125	2,163	1,833	2,276	1,916	2,146	2,168	2,315	2,360	1,975	2,444	2,153	2,336	2,345
2004	2,169	2,233	1,852	2,406	2,003	2,222	2,126	2,366	2,418	1,988	2,610	2,215	2,412	2,322
2005	2,235	2,264	1,822	2,365	2,049	2,255	2,261	2,414	2,448	1,988	2,601	2,262	2,436	2,422
2006	2,237	2,284	1,803	2,412	2,019	2,281	2,249	2,456	2,497	1,989	2,571	2,261	2,503	2,449
2007	2,235	2,281	1,883	2,278	2,001	2,300	2,220	2,479	2,516	2,062	2,582	2,257	2,538	2,456
RSE	1	1	4	6	3	2	2	1	1	5	5	2	2	2

A Represents an RSE that is greater than or equal to 100 or could not be computed.
NA Not available. RSE Relative Standard Error.
S Withheld because estimate did not meet publication standards on the basis of response rate, associated standard error, or a consistency review.

Appendix D - Law

LEGAL APPENDIX OF MEMOS

1. Tax Abatement
2. Energy Rights
3. TIF
4. Missouri Incentives
5. Federal Financial Incentives
6. Energy Efficient Tax Credits
7. Alternative Financing Options
8. Green Resources
9. CDGB
10. Title
11. Code Revisions
12. Introduction to LEED

MEMORANDUM

To: File

From: U-City Legal Group

Date: October 5, 2008

Re: Tax abatement

Does the green homes project qualify for tax abatement by University City?

U-City has the authority to grant tax abatements pursuant to the Real Property Tax Increment Allocation Redevelopment Act as codified in RSMo 99.700. According to Petree Eastman, the project homes on Bartmer and Crest seem to qualify for tax abatements pursuant to RSMo 99.700.

Under Chapter 99.700 RSMo, any party can seek abatement of real estate taxes in a constitutional charter city, having a Land Clearance for Redevelopment Authority (LCRA). According to Petree Easman, U-City is a constitutional charter city and does have an LCRA in place. In order to qualify for tax abatements under RSMo 99.7000, the area subject to the tax abatements must be considered "blighted," and a study indicating such findings must be prepared. Under RSMo 99.020.3, a "blighted area", is an "area which, by reason of the predominance of defective or inadequate street layout, insanitary or unsafe conditions, deterioration of site improvements, improper subdivision or obsolete platting, or the existence of conditions which endanger life or property by fire and other causes, or any combination of such factors, retards the provision of housing accommodations or constitutes an economic or social liability or a menace to the public health, safety, morals, or welfare in its present condition and use." For the most part, blighting studies have already been completed on Bartmer and Crest.

Once the blighting study has been completed, it goes before the LRCA council for passage of an ordinance designating the real property as blighted and qualifying the property for tax abatements. RSMo 99.700. Although getting the ordinance passed will take some time, the process should go smoothly given the fact that the blighting study has already been done. Finally, with respect to granting tax abatements for a period of 8 years, U-City has already come to an agreement that they can offer tax abatements for 8-10 years.

Why does U-City believe that tax abatements are the best option/incentive for financing this particular project?

Given that the area surrounding Bartmer and Crest does not qualify redevelopment area, U-City is very limited in terms what types of funding or financing options they can offer. According to Petree Eastman, offering tax abatements are the best route for this project because 1) attracts buyers 2) it lessens their mortgage payment allowing the developer to spend more and build a better house. According to Petree Eastman, offering tax abatements causes U-City to suffer a very miniscule loss. Furthermore, if this spurs more growth in the future, than U-City wins in the long run.

What types of tax abatements would be available if this became a large scale redevelopment project?

Alternative- Chapter 353 Tax Abatement

Source: Missouri Department of Economic Development, Division of Business and Community Services, http://go.missouridevelopment.org/353

Purpose of Chapter 353:

This statute was designed as an incentive that could be utilized by cities to encourage the redevelopment of "blighted areas" by providing real property tax abatement.

"Blighted Area":

Tax abatement under the Urban Redevelopment Corporations Law is only extended to real property that has been found to be a "blighted area" by the city. For purpose of 353 tax abatement the term "blighted area" is defined as:

That portion of the city within which the legislative authority of such city determines that by reason of age, obsolescence, inadequate or outmoded design or physical deterioration, have become economic and social liabilities, and such conditions are conducive to ill health, transmission of disease, crime or inability to pay reasonable taxes.

353.020 (2), RSMo.

Real property may be property found to be blighted even though it contains improvements, which by themselves do not constitute blight. (*Maryland Plaza Redevelopment Corporation v. Greenberg, 594S.W.2d 284 (1979)*.) Tax abatement may also be extended to a tract of real property, which by itself does not meet the definition of a blighted area if such tract is necessary to the redevelopment project and the area on the whole constitutes a blighted area. (*Parking systems, Inc. v. Kansas City Downtown Redevelopment Corporation, 518 S.W.2d 1191974*).It is our understanding, that the area in which the green homes project will take place, is considered a "blighted area" pursuant to RsMO 353.020(2).

Who Qualifies?

Tax abatement is only available to for-profit "Urban Redevelopment Corporations" organized pursuant to the Urban Redevelopment Corporations Law. The articles of association of Urban Redevelopment Corporations must be prepared in accordance with the general corporations laws of Missouri and must contain certain items set forth in Section 353.030, RSMo. of the Urban Redevelopment Corporations Law.

Eminent Domain Issue:

An Urban Redevelopment Corporation operating pursuant to a redevelopment agreement with a municipality (agreement must have been executed prior to December 31, 2006), has the right to acquire by the exercise of the power of eminent domain any real property in such redevelopment area in fee simple (absolute ownership of real property) or other estate which is necessary to accomplish the purpose of this chapter. 353. 130.2 RSMo. The Urban Redevelopment Corporation may exercise the power of eminent domain in such redevelopment area in the manner provided for by corporations under chapter 353, RSMO; or it may exercise the power of eminent domain in the manner provided by any other applicable statutory provision for the exercise of the power eminent domain. 353.130.3, RSMo.

Benefits/Uses:

Tax abatement is available for a period of 25 years, which begins to run when the Urban Redevelopment Corporation takes title to the property. During the first 10 years, the property is not subject to real property taxes except in the amount of real property taxes assessed on the land, exclusive of improvements, during the calendar year preceding the calendar year during which the Urban Redevelopment Corporation acquired title to the real property. 353.110.1, RSMo. If the property was tax exempt during such preceding calendar year, then the county assessor is required to assess the land, exclusive of improvements, immediately after the Urban Redevelopment Corporation takes title. During the next 15 years, the real property may be assessed up to 50% of its true value. 353.110.2, RSMo. Based on chapter 353, U-City has to authority to approve a redevelopment plan which provides full tax abatement for a period of 25 years. Thus, there should be no issues with offering tax abatements to homeowners for up to 8 years.

However, under chapter 353, payments in lieu of taxes (PILOTS) may be imposed on the Urban Redevelopment Corporation by contract with the city. PILOTS are paid on an annual basis to replace all or part of the real estate taxes, which are abated. The PILOTS must be allocated to each taxing district according to their proportionate share of ad valorem property taxes. 353.110.4, RSMo.

Application/Approval Process:

Urban Redevelopment Corporations have the power to operate one or more redevelopment projects; however such projects must be pursuant to a development plan which has been authorized by the city after holding a public hearing on the development plan. 353.060, RSMo. It may acquire property in its own name or in the name of nominees by gift, grant, lease, purchase, or otherwise. 353.130, RSMo. It may borrow funds and secure the repayment by mortgage. 353.150, RSMo.

Urban Redevelopment Corporations are required to maintain reserves for depreciation, obsolescence and the payment of taxes. 353.090, RSMo. The purpose of this requirement is to ensure that the redevelopment does not become blighted again.

Special Program Requirements:

The Urban Redevelopment Corporation must carefully plan the point in time at which it takes title to real property to ensure that it maximizes the benefits of 353 tax abatement. The 25 years starts to run as soon as the Urban Redevelopment Corporation takes title. Unless the current improvements on the real property have a significant assessed value, the Urban Redevelopment Corporation should not take title to the real property until the improvements to be made under the redevelopment project are completed. Until that time, title to the real property may be held by a related entity.

MEMORANDUM

TO: File

FROM: U-City Group

DATE: September 25, 2008

RE: Solar Energy Rights

Issue to Consider

Since the LEED certified homes being developed in this project are located next to property which U-City currently has not acquired at this point, developers and homeowners need to consider the legal issues that may arise if an adjoining landowner builds, remodels, or landscapes their property in such a way that will prevent the LEED homeowners from utilizing sunlight for the purpose of generating solar energy.

Summary of State and Federal Law

A number of federal and state courts have considered the rights of a landowner against interference by another, generally an adjoining landowner, with sunlight to be used for the purpose of generating solar energy. 29 A.L.R.4th 349. Since solar energy generating systems require open and unobstructed use of the available sunlight, thus potentially interfering with development of nearby land, a number of states have enacted statues governing the rights of access to sunlight. *Id.* In light of this project, U-City should consider access to solar energy as a factor to be considered when reformulating local zoning regulations. *Id.* (citing 14 Land and Water L. Rev 393, 395 (1979); 10 NM L Rev 121 (winter 1979).) Missouri has alternatively addressed this issue by setting forth terms that must be included in an easement obtained for the purpose of exposure to a solar energy device. *See* chapter 442*,* RSMO.

Under RSMo 442.012, the *right to utilize solar energy is a property right* but eminent domain may not be used to obtain such property right. The requirements for creating a solar easement are as follows:

Any easements obtained for the purpose of construction, reconstruction, remodeling or acquisition of a solar energy devices shall only be created in writing and shall be subject to the same conveyance and instrument recording systems as other easements. Any instrument creating a solar easement, shall include, but is not limited to: The vertical and horizontal angles, expressed in degrees, at which the solar easement extends over the real property subject to the solar easement and any terms or conditions or both under which the solar easement is granted or will be terminated. Easements for solar light shall be considered negative easement[1] and cannot be acquired by prescription but must be *negotiated expressly*. *RSMo, 442.012.2*

Potential Claims that May be Brought if Sunlight is Obstructed

- Easement theory-even in situations where there is no express easement for light, a number of jurisdictions, with some dissent have ruled that implied easements for light may arise, especially in cases of real and obvious necessity. Thus, a landowner may claim that there is a necessity for the generation for solar energy, so that an implied easement should be recognized. 29 A.L.R.4th 359

1 Easements are categorized as being either *affirmative* or *negative.* An *affirmative easement* entitles the holder to do something on another individual's land, whereas a *negative easement* divests an owner of the right to do something on the property. http://legal-dictionary.thefreedictionary.com/easement.

- Malicious motive-another possible claim a landowner may raise is that the offending structure was built solely out of malicious impulses to block the light. Although common law provides for no recourse, statues have been enacted in many jurisdictions prohibiting the erection of spit structures or fences erected with the malicious motive of injuring a landowner by shutting out his light, air, or view. *See Am. Jur. 2d, Adjoining Landowners § 107*

- Statutory Claims-claims based on statutory regulations of solar energy rights, such as prior appropriation, or zoning.

- Nuisance-courts will generally weigh the gravity of the harm to the plaintiff against the utility of the defendant's activity in deciding whether an action is a nuisance. Thus, the social utility of solar use may be found to so far outweigh the conflicting use of the airspace that the court would protect the solar user by enjoining the interference or by granting damages. In *Prah* v. Maretti, 108 Wis 2d 223, 312 (1982), the court held that the use of property by a landowner so as to interfere with the sunlight needed for the purposes of solar energy by another landowner could constitute a private nuisance. After speaking with Louis Seechrest, a certified LEED consultant, it is our understanding that this seems to be the most common claim brought by landowners in the St. Louis area who have had their access to sunlight restricted by adjoining landowners.

MEMORANDUM

To: File

From: U-City Legal Group

Date: October 20, 2008

RE: Tax Increment Financing

U-City TIF

The Tax Increment Financing (TIF) Commission, subject to the approval of the City Council, may exercise all powers delegated under the Real Property Tax Increment Allocation Act (RSMo), and in particular those enumerated in Section 99.820 (RSMo), i.e., to make recommendations to the City Council concerning the adoption of redevelopment plans and projects and the designation of redevelopment project areas pursuant to the notice and hearing requirements of Sections 99.800 to 99.865 (RSMo). The Commission is composed of nine members. The term of office is four years.

Does the U-City Project Qualify for Tax Increment Financing?

No, because the current project is not considered a redevelopment project. The area is not a redevelopment area because single family homes, unless completely leveled for new housing, do not qualify as a redevelopment projects or plans under 99.805.14-5, RSMo.

When is Tax Increment Financing used and is it a viable option for funding this project?

Tax increment Financing is generally used when project needs capital to build and there is a high likelihood that the property will increase in value in order to pay off the TIF. However, this may not be the best option for this particular project given the current real estate climate, and the nature of this housing project. Thus, TIF may be seen as very risky for the lender.

Summary of Local and State Tax Increment Financing

Missouri Statutes §§ 99.800 – 99.865 RSMo, outline the requirements and limitations on tax increment financing used for the purpose of financing the redevelopment of certain designated areas within the community.

Funding Limits (*See* § 99.845, RSMo)

Funding may be up to 100% of the local property tax and 50% of the economic activity taxes, The Bonds or other obligations secured by local TIF revenues must mature within 23 years. If State revenues are used, the program is limited in any year to the amount appropriated by the General Assembly, not to exceed $32,000,000 per year. § 99.845, RsMo. State TIF may be awarded for a period of up to 15 years (a longer period may be requested, but not to exceed 23 years). Any expenditures made before approval of State TIF cannot be reimbursed with State funds.

Types of benefits/description of benefits:

Local property tax, local sales tax, utility tax, and earnings tax for Local TIF designations. If a State TIF or Super TIF, then the benefits would also include state sales tax and withholding tax.

Local TIF provides for the use of local property tax up to 100% of the incremental value up to 23 years and 50% of the incremental value derived from economic activity taxes (includes sales, utility and earnings taxes) for a period of 23 years. If the TIF is designated as a State TIF, then the incremental value from state sales tax and withholding taxes would also be made available. Requests for a State TIF are made to the Missouri Department of Economic Development.

Uses

The TIF Act provides for the use of tax increment financing to pay all reasonable or necessary costs incurred or incidental to a redevelopment project. Such costs include the following: 1)Costs of studies, surveys and plans; 2) Professional service costs, such as financial advisory fees, bond counsel fees and planning expenses, subject to certain limitations as provided in the TIF Act; 3) Land acquisition and demolition costs;

4) Costs of rehabilitating and repairing existing buildings; 5) Initial costs for an economic development area; 6) Costs of constructing public works or improvements, such as street lighting, street repairs or parking; 7)Financing costs, including bond issuance costs, capitalized interest and reasonable reserves; 8) Capital costs incurred by any taxing jurisdiction as a direct result of the project; 9) Relocation costs; and 10) Payment in lieu of taxes.

Eligibility Requirements

To determine whether a project qualifies for TIF financing, a project is reviewed based upon the overall economic impact opportunity after the redevelopment of the specified project area.

The TIF Act requires the municipality to make two key determinations before approving a TIF project. First, the redevelopment area must be classified as a "blighted" or a "conservation" area. A "blighted area" is defined as an area which, by reason of the predominance of defective or inadequate street layout, unsanitary or unsafe conditions, deterioration of site improvements, improper subdivision or obsolete platting, or the existence of conditions which endanger life or property by fire and other causes, or any combination of such factors, retards the provision of housing accommodations or constitutes an economic or social liability or a menace to the public health, safety, morals, or welfare in its present condition and use. Blighted areas in enterprise zones, blighted areas in federal empowerment zones, or blighted areas in central business district or urban core areas may qualify for the rebate of new State revenues. The central business district or urban core area must contain one or more buildings at least 50 years old, suffer from generally declining population or property taxes, or be a certain historic hotel described in the TIF Act or a certain federally-approved levee district. If the TIF Act power of condemnation will be used, the redevelopment plan must include a parcel-by-parcel determination of blight.

A "conservation area" is any improved area within the boundaries of a redevelopment area located within the territorial limits of a municipality in which 50% or more of the structures in the area have an age of 35 years or more. Such an area is not yet a blighted area but is detrimental to the public health, safety, morals, or welfare and may become a blighted area because of any one or more of the following factors: dilapidation; obsolescence; deterioration; illegal use of individual structures; presence of structures below minimum code standards; abandonment; excessive vacancies; overcrowding of structures and community facilities; lack of ventilation, light or sanitary facilities; inadequate utilities; excessive land coverage; deleterious land use or layout; depreciation of physical maintenance; and lack of community planning. A conservation area is required to meet at least 3 of the above factors.

The second required determination is the "but for" test: but for the adoption of the redevelopment plan, the redevelopment area would not reasonably be anticipated to be developed. The TIF Act requires the developer to provide an affidavit of this determination.

Special requirements

Any county that desires to implement a TIF project within the boundaries of a city within the county must first obtain the permission of the city's governing body. Before a municipality may implement tax increment financing, (1) the municipality must create a TIF commission made up of representatives of all taxing districts within the redevelopment area, (2) a redevelopment plan, including a description of the redevelopment area and redevelopment projects therein and a cost-benefit analysis must be prepared, (3) the TIF commission must hold a public hearing and make a recommendation to the municipality pertaining to the redevelopment plan, the redevelopment project and the designation of the redevelopment area, and (4) the municipality must adopt an ordinance approving the redevelopment plan, the redevelopment projects and the designation of the redevelopment area. Once the ordinance is adopted, tax increment financing may be implemented for one or more redevelopment projects within a redevelopment area.

Suggestions:

To increase development size and expand financing options, look at foreclosed and abandoned properties, Brownfield sites, and look into getting retail, historic buildings, low income housing tax credits/funds.

Sources: St. Louis Regional Chamber & Growth Association (RCGA), Missouri Department of Economic Development: www.MissouriDevelopment.org; 99.805.14-5, RSMo.

MEMORANDUM

To: Legal File

From: U-City Legal Group

Date: October 22, 2008

Re: Missouri Incentives/Rules/Regulations

Below are some relevant incentives, as wells as regulations surrounding renewable and efficient energy.

Missouri Incentives for Renewables and Efficiency

1) Laclede Gas Company - Energy Efficient Appliance and HVAC Equipment Rebate Program

- Incentive Type: Utility Rebate Program
- Eligible Efficiency Technologies: Furnaces, Boilers
- Applicable Sectors: Commercial, Residential, Multi-Family Residential
- Incentive Amount: Varies
- Maximum Incentive: $10,000 maximum for commercial customers
- $5,000 maximum for rental property owners
- Equipment Requirements: Must be Energy Star rated or have an efficiency level of 90% or greater
- Website: http://www.lacledegas.com/customer/rebate.php

Summary:

Laclede Gas Company provides incentives for its customers to purchase and install highly efficient natural gas utilization equipment that meets or exceeds the 90% efficiency level and/or has received the Energy Star rating. Rebates on such equipment are available to commercial customers, residential customers, and landlords who rent to residential customers of Laclede Gas Company and its operating divisions.

Residential Customers can qualify for a $250 rebate on a qualified furnace or boiler or a $450 rebate on a qualified water heater/furnace combination unit. This rebate is limited to one heating system per Laclede account.

Commercial Customers can qualify for a $750 rebate on a qualified appliance or heating system, up to a maximum refund of $10,000 per customer.

Residential Rental Property Owners can qualify for a rebate of $750 per heating system that serves multiple units or $250 per heating system that serves single units. Rental property must be of eight (8) units or less all contained within a single building. The maximum allowable rebate is $5,000 per property owner.

2) Laclede Gas - Loan Programs for Energy Efficiency

- Incentive Type: Utility Loan Program
- Eligible Efficiency Technologies: Clothes Washers/Dryers, Dishwasher, Refrigerators/Freezers, Water Heaters, Furnaces, Air conditioners, Caulking/Weather-stripping, Building Insulation, Doors
- Applicable Sectors: Commercial, Residential, Low-Income Residential
- Terms: Insulation Financing: Up to $2,000 at 3% interest rate
- EnergyWise Dealer: Up to $10,000, with 5% down payment
- Website: http://www.lacledegas.com/customer/financing.php

Summary:

The Laclede Gas Company offers two loan programs for customers to improve energy efficiency.

The Insulation Financing Program loans funds to qualifying residential customers for insulation improvements to their homes, up to $2,000 at a 3% interest rate. Any leftover funds may be used for the purchase of storm windows and doors. To apply, contact Laclede Gas.

The EnergyWise Dealer Program loans funds to qualifying residential and commercial customers for the purchase of energy-efficient gas furnaces, gas appliances and air conditioners, up to $10,000 with a 5% down payment. The program has an overall limit of four heating systems per customer. Eligible customers should contact Laclede Gas.

In addition, in conjunction with the St. Louis Office of the Association of Community Organization for Reform Now (ACORN), the EnergyWise Dealer Program has been expanded to include low-income residential rental property managers. A qualifying property manager can qualify for a no-interest loan, with no loan inspection costs and a reimbursement on the down payment.

3) Columbia Water & Light - Super Saver Loans

- Incentive Type: Utility Loan Program
- Eligible Efficiency Technologies: Furnaces, Heat pumps, Air conditioners, Duct/Air sealing, Building Insulation, Windows, Doors
- Eligible Renewable/Other Technologies: Solar Water Heat, Solar Space Heat
- Applicable Sectors: Residential

- Terms: Fixed low interest rate determined by a weekly index of tax-exempt notes;
- Five year payback period
- Website: http://www.gocolumbiamo.com/
- WaterandLight/Conservation/loans.php

Summary:

The Columbia Water & Light (CWL) Super Saver Loans allow Columbia residents to finance energy improvements to their homes with affordable, low interest loans with five year terms. The loans can be used to install insulation, heating and cooling systems, solar water heating and solar space heating. Before work commences, a representative from Columbia Water & Light will conduct an energy audit of the home and suggest ways in which the home's efficiency could be improved.

Eligible insulation measures may be installed in several strategic areas of the home with specific minimum R-value requirements for each area. A new furnace can be financed by a Super Saver Loan only if it is installed along with a new central air conditioner with an efficiency rating of 14 SEER or higher. Further, combustion furnaces must have an efficiency rating of 80% AFUE or higher. Solar water heaters must provide at least 50% of water heating costs to be eligible for financing; and solar space heating systems must involve active solar heat collectors to qualify. Financing is also available for new heat pumps or the replacement of an existing heat pump. All financed heat pumps must have minimum efficiency ratings of 14 SEER and 8.0 HSPF. Customers installing a high efficiency heat pump will be offered a reduced electric rate during the months of November through May if their air conditioning unit has a load management switch installed on it.

Participants in the utility's Home Performance with Energy Star program may also be eligible for a Super Saver Loan for windows, doors, and air duct sealing improvements, subject to minimum performance standards for each type of improvement.

4) Energy Loan Program

- Incentive Type: State Loan Program
- Eligible Efficiency Technologies: Lighting, Air conditioners, Building Insulation, Windows, Custom/ Others pending approval, Other Unspecified
- Eligible Renewable/Other Technologies: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Photovoltaics, Wind, Biomass
- Applicable Sectors: Schools, Local Government, Institutional, Public Hospitals, Water Treatment Facilities
- Amount: Varies
- Maximum Amount: $1 million
- Terms: Rates set 0.5% below 20-Bond Index interest rate (see website for details);

- Terms of up to 15 years
- Program Budget: $3.8 million (2009 application cycle)
- Expiration Date 10/15/2008 (2009 application cycle, now expired)
- Website: http://www.dnr.mo.gov/energy/financial/loan.htm
- Authority 1: R.S. Mo. § 640.651-640.686
- Effective Date: 1989

Summary:

This loan program, administered by the Energy Center of the Missouri Department of Natural Resources, is available for energy efficiency and renewable energy projects for public and governmental buildings and structures. Loan amounts are based on projected energy savings, resulting in monetary savings that is used to repay the loan. Financing is available at a fixed interest rate below the market rate, and repayment schedules are determined on an individual project basis. Repayment schedules may not exceed 15 years. Loans under this program are determined on a competitive basis according to sector and payback period.

The application deadline for the 2009 loan cycle is October 15, 2008 (now expired). Loan agreements will be awarded by December 31, 2008. Up to $3.8 million in loan funding is available during this cycle in amounts of up to $1 million. Sector allocations are listed below, with unused funds being made available to other eligible sectors.

-Public Schools (K-12) - 50%

-City and County Governments - 25%

-Public Higher Education Institutions - 25%

Since the program's inception in 1989, loans totaling over $80 million have been made to the applicable sectors, resulting in an estimated savings of $146 million.

4) Tax Deduction for Home Energy Efficiency Improvements

- Incentive Type: Personal Deduction
- Eligible Efficiency Technologies: Yes; specific technologies not identified, Energy audit costs
- Applicable Sectors: Residential
- Amount: 100% of the cost of improvements
- Maximum Amount: $1,000 per return; $2,000 cumulatively per taxpayer
- Terms: Requires energy audit from DNR certified home energy auditor; only cost of audit and improvements identified during audit are eligible.

- Authority 1: S.B. 1181
- Date Enacted: 07/10/2008
- Effective Date: 01/01/2009

Summary:

In July 2008, the state of Missouri enacted legislation allowing homeowners to deduct from their income taxes the cost of home energy audits and energy efficiency improvements based on recommendations made in such an audit. The tax deduction is valid for expenses of this nature incurred on or after January 1, 2009. The deduction has $1,000 limit per individual or joint taxpayer return and a $2,000 cumulative limit per individual or joint taxpayer. All deductions must be taken in the year in which the expenses were incurred. Audits must be performed by a home energy auditor certified by the Missouri Department of Natural Resources (DNR). A taxpayer may not take a deduction for work that received any sort of incentive or rebate through the state or through a utility-sponsored program.

Rules, Regulations & Policies

1) Interconnection Standards

- Incentive Type: Interconnection
- Eligible Renewable/Other Technologies: Solar Thermal Electric, Photovoltaics, Wind, Fuel Cells using Renewable Fuels
- Applicable Sectors: Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Fed. Government, Institutional
- Special Rules for Net-Metered Systems? Yes
- Limit on System Size/Overall Enrollment: 100 kW / 5% of a utility's single-hour peak load during the previous year
- Standard Interconnection Agreement? Yes
- Additional Insurance Requirements? For systems up to 10 kW: no; for systems greater than 10 kW: yes
- External Disconnect Required? Utilities are authorized to require a disconnect switch
- Rules for Non-Net-Metered DG? No
- Website: http://www.sos.mo.gov/
- adrules/csr/current/4csr/4c240-20.pdf
- Authority 1: SB 54 of 2007
- Date Enacted: 6/25/2007
- Effective Date: 1/1/2008

Summary:

Note: The Missouri Public Service Commission will develop rules to implement SB 54 by October 1, 2008.

Missouri enacted legislation (SB 54) in June 2007 requiring all of the state's electric utilities -- including municipal utilities and electric cooperatives -- to offer net metering to customers with systems up to 100 kilowatts (kW) in capacity that generate electricity using wind energy, solar-thermal energy, hydroelectric energy, photovoltaics (PV), fuel cells using hydrogen produced by any of these resources, and other sources of energy certified as renewable by the Missouri Department of Natural Resources. Systems must be intended primarily to offset part or all of a customer's own electrical energy requirements, and must be located on a facility owned, operated, leased or otherwise controlled by the customer.

Utilities must offer a net-metering tariff or contract that is identical in electrical energy rates, rate structure, and monthly charges to the contract or tariff that the customer would be assigned if the customer were not an eligible customer-generator. Utilities may not charge the customer any additional standby, capacity, interconnection, or other fee or charge that would not otherwise be charged if the customer were not an eligible customer-generator.

Systems must meet all applicable safety, performance, interconnection and reliability standards established by any local code authorities, the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Institute of Electrical and Electronics Engineers (IEEE), and Underwriters Laboratories (UL) for distributed generation. Utilities may require customers to provide a switch, circuit breaker, fuse or other easily accessible device or feature that allows the utility to manually disconnect the system.

No additional liability insurance is required for systems up to 10 kW in capacity. For systems greater than 10 kW, the Missouri Public Service Commission (PSC) and utilities not regulated by the PSC must (1) adopt safety, performance, and reliability standards and requirements; and (2) establish the qualifications for exemption from a requirement to install additional controls, perform or pay for additional tests or distribution equipment, or purchase additional liability insurance. All system owners must indemnify the utility.

Applications for interconnection must be accompanied by a plan for the customer's system, including a wiring diagram and specifications for the generating unit. Utilities must review and respond to the customer within 30 days for systems up to 10 kW, and within 90 days for systems greater than 10 kW. Prior to interconnection, a customer must furnish the utility with certification from a qualified professional electrician or engineer that the installation complies with the established safety and operating requirements.

Any costs incurred by a utility under Missouri's net-metering statute are recoverable in the utility's rate structure. The estimated generating capacity of all net-metered systems counts towards the respective utility's accomplishment of any renewable-energy portfolio target or mandate adopted by Missouri. Each utility must file an annual report describing the status of its program.

The Missouri Public Service Commission (PSC) and utilities not regulated by the commission are required to adopt initial rules by October 1, 2008, including regulations ensuring that simple contracts will be used for interconnection and net metering. For systems up to 10 kW, the application process includes all-in-one document that includes a simple interconnection request, simple procedures, and a brief set of terms and conditions.

* Prior to the June 2007 legislation, Missouri required certain utilities to offer "dual metering" to consumers. "Dual metering" is much less favorable to consumers than net metering.

2) Net Metering

- Incentive Type: Net Metering
- Eligible Renewable/Other Technologies: Solar Thermal Electric, Photovoltaics, Wind, Hydroelectric, Fuel Cells using Renewable Fuels
- Applicable Sectors: Commercial, Industrial, Residential, General Public/Consumer, Nonprofit, Schools, Local Government, State Government, Fed. Government, Agricultural, Institutional
- Limit on System Size: 100 kW
- Limit on Overall Enrollment: 5% of a utility's single-hour peak load during the previous year
- Treatment of Net Excess: Credited to customer's next bill at utility's avoided-cost rate; granted to utility at end of 12-month period
- Utilities Involved: All utilities
- Interconnection Standards for Net Metering? Under development
- Authority 1: SB 54 of 2007
- Date Enacted: 6/25/2007
- Effective Date: 1/1/2008

Summary:

Note: The Missouri Public Service Commission will develop rules to implement SB 54 by October 1, 2008.

Missouri enacted legislation in June 2007 (SB 54) requiring all electric utilities -- investor-owned utilities, municipal utilities and electric cooperatives -- to offer net metering to customers with systems up to 100 kilowatts (kW) in capacity that generate electricity using wind energy, solar-thermal energy, hydroelectric energy, photovoltaics (PV), fuel cells using hydrogen produced by one of the aforementioned resources, and other sources of energy certified as renewable by the Missouri Department of Natural Resources. Systems must be intended primarily to offset part or all of a customer's own electricity requirements, and must be located on a premises owned, operated, leased or otherwise controlled by the customer. The new law took effect January 1, 2008.*

Net metering is available until the total rated generating capacity of net-metered systems equals 5% of a utility's single-hour peak load during the previous year. However, in a given calendar year, the aggregate capacity of all approved applications for interconnection is limited to 1% of a utility's single-hour peak load for the previous calendar year. If a customer's existing metering equipment is not capable of measuring the net amount of electricity produced or consumed, or if it is necessary for the utility to install "additional distribution equipment to accommodate the customer-generator's facility," then the customer must pay for these costs.

Customer net excess generation (NEG) during a given month is credited to the customer's next bill at the utility's avoided-cost rate. Any NEG remaining at the end of a 12-month period is granted to the utility with no compensation for the customer.

Utilities must offer a net-metering tariff or contract that is identical in electrical energy rates, rate structure, and monthly charges to the contract or tariff that the customer would be assigned if the customer were not an eligible customer-generator. Utilities may not charge the customer any additional standby, capacity, interconnection, or other fee or charge that would not otherwise be charged if the customer were not an eligible customer-generator.

Any costs incurred by a utility under Missouri's net-metering statute are recoverable in the utility's rate structure. The estimated generating capacity of all net-metered systems counts towards the respective utility's accomplishment of any renewable-energy portfolio target or mandate adopted by Missouri. Each utility must file an annual report describing the status of its program.

The Missouri Public Service Commission (PSC) and utilities not regulated by the commission are required to adopt initial rules by October 1, 2008, including regulations ensuring that simple contracts will be used for interconnection and net metering. For systems up to 10 kW, the application process includes all-in-one document that includes a simple interconnection request, simple procedures, and a brief set of terms and conditions.

* Prior to the June 2007 legislation, Missouri required certain utilities to offer "dual metering" to consumers. "Dual metering" is much less favorable to consumers than net metering.

3) Solar Easements

- Incentive Type: Solar Access Law/Guideline
- Eligible Renewable/Other Technologies: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics
- Applicable Sectors: Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Fed. Government
- Authority 1: R.S. Mo. § 442.012
- Date Enacted: 1979

Summary:

In Missouri, the right to utilize solar energy is a property right, but eminent domain may not be used to obtain such property rights. Easements obtained for the purpose of construction, reconstruction, remodeling or acquisition of a solar energy system should be created in writing and are subject to the same conveyance and instrument recording requirements as other easements. Solar easements are considered a negative easement and cannot be acquired by prescription; they must be negotiated expressly.

4) LEED Incentive Grant Program-Ameren-07/08

~Note-Home Projects do not qualify

Program:

The LEED Incentive Grant Program is designed to accelerate green building practices, energy conservation and environmental performance in the St. Louis Region. Incentive grants will be awarded to encourage the construction of LEED certified green buildings that will serve as examples for future projects.

Project Eligibility

 The building which is being LEED certified must be within the AmerenUE electric service area. *AmerenUE service area does not include Illinois and parts of Kirkwood.*

 Grants will be awarded to the project owner or developer. The application can be made on behalf of the project owner or developer by a building professional (such as but not limited to: architect, contractor, sustainable design consultant or LEED accredited professional)

 New Construction and major renovations or remodeling projects that will follow any current or pilot LEED Green Building Rating System (for a list of LEED products, http://www.usgbc.org/DisplayPage.aspx?CategoryID=19).

 The project must be LEED registered between June 1, 2006 and December 31, 2006. Projects LEED registered before the start of the program (June 1, 2006) are not eligible.

 LEED Incentive Grants are not to be applied to construction costs ("hard" costs) and are to be used for "soft" costs only, such as, but not limited to:

- LEED Certification fee
- LEED Documentation
- Professional Services such as Energy Modeling, Daylighting Analysis and

  /or Modeling, and Life Cycle Analysis (LCA)
- Commissioning
- Building Design Charrette facilitated by a LEED Accredited Professional

Application Guidelines:

Complete applications will consist of the following:

 Completed Application Form

 A schedule of how grant funds will be used

 Verification of LEED registration

 LEED checklist of preliminary goals

 A one page project description – NO DRAWINGS OR GRAPHICS ACCEPTED.

 Signed Letter of Intent which commits grantees to the following:

o Achieving LEED certification

o Making their facilities available for green building tours

o Achieving LEED Energy & Atmosphere credit 1.1. *To achieve this credit the building must reduce energy cost by a minimum of 15% for new buildings and 5% for existing buildings compared to the energy cost budget for energy systems regulated by ASHRAE/IESNA Standard 90.1-1999 (without amendments), as demonstrated by a whole building simulation using the Energy Cost Budget Method described in Section 11 of the Standard.*

o Providing proof of LEED certification from the U.S. Green Building Council to receive full grant funds.

Criteria for Selection:

 The project must meet the eligibility requirements listed above.

 The applicant must submit a complete application package (application form, verification of LEED registration, LEED check list of preliminary goals, one page project description, and signed Letter of Agreement) to USGBC-STL by December

31, 2006.

 Funds will be disbursed at the discretion of a Selection Committee approved by USGBC-STL.

 Grants will be awarded on a first come, first served basis with the goal of encouraging a mixture of project types, a mixture of public and private projects and a mixture and LEED types (LEED-NC, LEED-EB, LEED-CI, LEED-CS pilot).

Funding:

 Up to $120,000 of grants will be awarded over the funding period.

 Start-Up Funding - $5,000 of funds will be dispensed to successful applicants within forty-five days of award of grant.

 Completion Funding - The balance of funds, if any, will be dispensed within forty-five days of award of LEED certification. If LEED Certified, the project will receive $10,000 above the initial $5,000. If LEED Silver $15,000; if LEED Gold $20,000; and if LEED Platinum $25, 000. Availability of funds depends on the number of projects receiving Start-Up funding and the completion Funding will be rewarded on a first-come basis.

 If the project fails to achieve LEED certification within six months of the date of the Occupancy Permit the balance of funds may be retained for use on other projects.

 Grants to participants will be available until funds are depleted. *Any questions about LEED Incentive Grant Program must be submitted in writing by mail, e-mail or fax to:*

USGBC-STL

3617 Grandel Square

St. Louis, MO 63108

(314) 577-0298

usgbc-stl@mobot.org

All questions and answers will be posted regularly at http://www.earthwayscenter.org/usgbc.html.

Source: http://www.ameren.com/Business/ADC_LEEDguidelines.pdf

MEMORANDUM

To: Legal File

From: U-City Legal Group

Date: October 22, 2008

Re: Federal Financial Incentives

Financial Incentives

Below are some of the federal financial incentives this project may be eligible for:

1) Clean Renewable Energy Bonds (CREBs)

- Incentive Type: Federal Loan Program
- Eligible Renewable/Other Technologies: Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Small Irrigation Power
- Applicable Sectors: Local Government, State Government, Tribal Government, Municipal Utility, Rural Electric Cooperative
- Website: http://www.irs.gov/irb/2007-14_IRB/ar17.html
- Authority 1: 26 USC § 54
- Effective Date: 8/8/2005
- Expiration Date: 12/31/2008

Summary:

The federal Energy Tax Incentive Act of 2005, under Title XIII of the federal Energy Policy Act of 2005 (EPAct 2005), established Clean Energy Renewable Bonds (CREBs) as a financing mechanism for public sector renewable energy projects. This legislation originally allocated $800 million of tax credit bonds to be issued between January 1, 2006, and December 31, 2007.

Following the enactment of the federal Tax Relief and Health Care Act of 2006, the Internal Revenue Service made an additional $400 million in CREBs financing available for 2008 through Notice 2007-26. In February 2008, the IRS announced 312 projects eligible to be financed with tax-credit bonds under the CREBs program.

CREBs may be issued by electric cooperatives, government entities (states, cities, counties, territories, Indian tribal government, or any political subdivision thereof), and certain lenders. Of the $1.2 billion total of tax-credit bond volume cap allocated to fund renewable-energy projects, state and local government borrowers are limited to $750 million of the volume cap, with the rest reserved for qualified mutual or cooperative electric companies.

CREBs are issued with a 0% interest rate. The borrower pays back only the principal of the bond, and the bond-holder receives federal tax credits in lieu of the traditional bond interest. Tax credit funds are allocated by the U.S. Treasury Department. The tax credit rate is set daily by the U.S. Treasury Department and may be taken quarterly on a dollar-for-dollar basis to offset the tax liability of the bondholder.

CREBs differ from traditional tax-exempt bonds in that the tax credits issued through CREBs are treated as taxable income for the bondholder. The tax credit may be taken each year the bondholder has a tax liability as long as the credit amount does not exceed the limits established by EPAct 2005.

2) Energy Efficient Mortgages

- Incentive Type: Federal Loan Program
- Eligible Efficiency Technologies: Yes; specific technologies not identified
- Eligible Renewable/Other Technologies: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Photovoltaics, Daylighting
- Applicable Sectors: Residential
- Website: http://www.resnet.us/ratings/mortgages/default.htm

Summary:

Homeowners can take advantage of energy efficient mortgages (EEM) to finance a variety of energy efficiency measures, including renewable energy technologies, in a new or existing home. The U.S. federal government supports these loans by insuring them through Federal Housing Authority (FHA) or Veterans Affairs (VA) programs. This allows borrowers who might otherwise be denied loans to pursue energy efficiency improvements, and it secures lenders against loan default.

The federal Energy Star program has a partnership program for lenders whereby lenders who provide EEMs to borrowers may become Energy Star lender partners. These EEMs may or may not be used to purchase an Energy Star qualified home. Becoming a partner allows lenders to utilize the Energy Star brand to promote themselves as Energy Star partners offering EEMs. To become a lender partner lenders must first provide proof that they know how to write EEMs. To maintain their partnership benefits, lenders must write a certain number of EEMs per year. Energy Star does not have a lender certification program or process. Click here for more

information about Energy Star's lender partnership program. As of August 2008, the federal Energy Star program lists 61 private lenders who offer homebuyer assistance, HERS assistance, special financing, and other assistance to applicants buying homes with the Energy Star rating. Energy Star requires that its lender partners provide EEMs to qualified borrowers regardless of whether it is an FHA EEM, Fannie Mae EEM, or VA EEM.

FHA Energy Efficient Mortgages

The FHA allows lenders to add up to 100% of energy efficiency improvements to an existing mortgage loan by insuring a loan of up to 5% of a home's appraised value with certain restrictions. FHA mortgage limits vary by county, state and the number of units in a dwelling. See www.fha.com/lending_limits.cfm for more details.

Loan amounts may not exceed the projected savings of the energy efficiency improvements. These loans may be combined with FHA 203 (h) mortgages available to victims of presidentially-declared disasters and with financing offered through the FHA 203 (k) rehabilitation program. FHA loan limits do not apply to the EEM. Homebuyers must submit a Home Energy Rating (HER), contractor bids, and a FHA B Worksheet. This process may become streamlined in 2009 as a result of the Housing and Economic Recovery Act of 2008, which requires HUD to report to congress with ways to remove the administrative barriers and increase consumer participation and awareness of these financing options.

Presently, up to $200 of the cost of the HER may be included in the mortgage, and borrowers may include closing costs and the up-front mortgage insurance premium in the total cost of the loan. The loan is available to anyone who meets the income requirements for FHA's Section 203 (b), provided the applicant can meet the monthly mortgage payments. New and existing owner-occupied homes of up to two units qualify for this loan. Cooperative units are not eligible. Homebuyers should submit applications to their local HUD Field Office through an FHA-approved lending institution, or they can apply directly online at www.fha.com/energy_efficient.cfm. See also www.hud.gov/offices/hsg/sfh/eem/energy-r.cfm.

Department of Veterans Affairs (VA) Energy Efficient Mortgages

The VA insures EEMs to be used in conjunction with VA loans either for the purchase of existing homes or for refinancing loans secured by the dwelling. Homebuyers may borrow up to $3,000 if only documentation of improvement costs or contractor bids is submitted, or up to $6,000 if the projected energy savings are greater than the increase in mortgage payments. Loans may exceed this amount at the discretion of the VA. Applicants may not include the cost of their own labor in the total amount. No additional home appraisal is needed, but applicants must submit a HER, contractor bids and certain other documentation. The VA insures 50% of the loan if taken by itself, but it may insure less if the total value of the mortgage exceeds a certain amount.

This mortgage is available to qualified military personnel, reservists and veterans. (See www.homeloans.va.gov/elig2.htm for more details). Applicants should secure a certificate of eligibility from their local lending office and submit it to a VA-approved private lender. If the loan is approved, the VA guarantees the loan when it is closed.

Conventional EEMs

Like Energy Star mortgages, conventional mortgages are not backed by a federal agency. Private lenders sell loans to Fannie Mae and Freddie Mac, which in turn allow homebuyers to borrow up to 15% of an existing home's appraised value for improvements documented by a HER.

Fannie Mae also lends up to 5% for Energy Star new homes. Fannie Mae EEMs are available to single-family, owner-occupied units, and Fannie Mae provides EEMs to those whose income might otherwise disqualify them from receiving the loans by allowing approved lenders to adjust borrowers' debt-to-income ratio by 2%. The value of the improvements is immediately added to the total appraised value of the home.

Freddie Mac offers EEMs for one- to four-unit dwellings and also helps raise the effective income of the borrower to qualifying levels by allowing lenders to increase the borrower's income by a dollar amount equal to the estimated energy savings. Any energy efficiency improvements can qualify, and these mortgages can be combined with both fixed-rate and adjustable-rate mortgages. Borrowers should apply directly to the lender. See www.natresnet.org/resources/lender/default.htm for more details.

3) Residential Energy Conservation Subsidy Exclusion (Personal)

- Incentive Type: Personal Exemption
- Eligible Efficiency Technologies: Yes; specific technologies not identified
- Eligible Renewable/Other Technologies: Solar Water Heat, Solar Space Heat, Photovoltaics
- Applicable Sectors: Residential, Multi-Family Residential
- Amount: 100% of subsidy
- Website: http://www.irs.gov/publications/p525/index.html
- Authority 1: 26 USC § 136

Summary:

According to Section 136 of the IRS Code, energy conservation subsidies provided by public utilities,* either directly or indirectly, are nontaxable: "Gross income shall not include the value of any subsidy provided (directly or indirectly) by a public utility to a customer for the purchase or installation of any energy conservation measure."

The term "energy conservation measure" includes installations or modifications primarily designed to reduce consumption of electricity or natural gas, or improve the management of energy demand. Eligible dwelling units include houses, apartments, condominiums, mobile homes, boats and similar properties. If a building or structure contains both dwelling and other units, any subsidy must be properly allocated.

Given the definition of "energy conservation measure," there is strong evidence that utility rebates for residential solar thermal and solar electric projects may be nontaxable. However, the IRS has not ruled definitively on this issue. For taxpayers considering using this provision for renewable energy systems, consultation with a tax attorney is advised.

Other types of utility subsidies that may come in the form of credits or reduced rates may also be nontaxable, according to IRS Publication 525:

"Utility rebates. If you are a customer of an electric utility company and you participate in the utility's energy conservation program, you may receive on your monthly electric bill either: a reduction in the purchase price of electricity furnished to you (rate reduction), or a nonrefundable credit against the purchase price of the electricity. The amount of the rate reduction or nonrefundable credit is not included in your income."

* The term "public utility" is defined as an entity "engaged in the sale of electricity or natural gas to residential, commercial, or industrial customers for use by such customers." The term includes federal, state and local government entities.

4) Residential Energy Efficiency Tax Credit

- Incentive Type: Personal Tax Credit
- Eligible Efficiency Technologies: Water Heaters, Furnaces, Boilers, Heat pumps, Air conditioners, Building Insulation, Windows, Doors, Roofs, Circulating fans used in a qualifying furnace
- Eligible Renewable/Other Technologies: Stoves that use qualified biomass fuel
- Applicable Sectors: Residential
- Amount: 10% of cost of building envelope improvements; 100% for qualified energy property (heating, cooling, water heaters), but with certain maximum limits
- Maximum Incentive: Varies by technology; no more than $500 for all improvements combined
- Equipment/Installation Requirements: Equipment must be new and in compliance with all applicable performance and safety standards; performance and quality standards vary by technology
- Authority 1: 26 USC § 25C
- Date Enacted: 8/8/2005 (amended 2008)
- Effective Date: 1/1/2006

- Expiration Date: 12/31/2007
- Authority 2: H.R. 1424: Div. B, Sec. 302 (The Energy Improvement and Extension Act of 2008)
- Date Enacted: 10/3/2008
- Effective Date: 1/1/2009
- Expiration Date: 12/31/2009

Summary:

The federal tax credit for energy efficient home improvements was established by the Energy Policy Act of 2005. After expiring on December 31, 2007, the credit was extended by The Energy Improvement and Extension Act of 2008 (H.R. 1424, Division B), and now applies to eligible equipment purchased between January 1, 2009 and December 31, 2009. Equipment purchased during calendar year 2008 is not eligible for the tax credit. In addition to extending the credit, H.R. 1424 modified the efficiency requirements for water heaters; removed the geothermal heat pump credit from 26 USC § 25C and moved it to 26 USC § 25D; and extended the credit to stoves that use biomass fuel and asphalt roofs with appropriate cooling granules.

The credit applies to energy efficiency improvements in the building envelope of existing homes and for the purchase of high-efficiency heating, cooling and water-heating equipment. Efficiency improvements or equipment must serve a dwelling in the United States that is owned and used by the taxpayer as a primary residence. The maximum amount of homeowner credit for all improvements combined is $500 during the three year period of the tax credit (2006, 2007 and 2009). Geothermal heat pumps were originally included with these credits and subject to a $300 cap. Geothermal heat pumps are now covered by the Residential Renewable Energy Tax Credit, with a $2,000 cap.

Building Envelope Improvements

Owners of existing homes can receive tax credits of up to 10% of the cost of upgrading the efficiency of the building's envelope. Components eligible for the credit include:

insulation materials and systems designed to reduce a home's heat loss or gain;

exterior doors and windows (including skylights); and

pigmented metal roofs designed to reduce heat gain, asphalt roofs with appropriate cooling granules.

Credits for windows may not exceed $200, and the total amount of credits for building envelope measures and other qualified energy property outlined below must not exceed $500.

Improvements should be expected to remain in use for at least five years. Metal roofs and asphalt roofs must

meet Energy Star requirements, and all other improvements must meet 2000 International Energy Conservation Code criteria, including supplements. Manufactured homes conforming to Federal Manufactured Home Construction and Safety Standards also qualify.

Heating, Cooling, and Water Heating Equipment

Purchasers of qualified energy efficient property are eligible for tax credits up to the total expenditures on such property. The credit can also be applied to labor costs for assembly and original installation of this property. Eligible property and maximum credit amounts are as follows:

- electric heat pump water heaters: $300;
- electric heat pumps: $300;
- central air conditioners: $300;
- natural gas, propane or oil water heaters: $300;
- natural gas, propane or oil furnace or hot water boilers: $150;
- advanced main air circulating fans: $50; and
- biomass stoves that use “any plant-derived fuel available on a renewable or recurring basis, including agricultural crops and trees, wood and wood waste and residues (including wood pellets), plants (including aquatic plants), grasses, residues, and fibers”: up to $300.

Performance and quality standards for tax credit eligibility vary by technology. See 26 USC § 25C and H.R. 1424 above for details. Additionally, the Internal Revenue Service (IRS) has provided the following guidance relating to the credit: IRS Notice 2006-26.

5) Residential Renewable Energy Tax Credit

- Incentive Type: Personal Tax Credit
- Eligible Renewable/Other Technologies: Solar Water Heat, Photovoltaics, Wind, Fuel Cells, Geothermal Heat Pumps, Other Solar Electric Technologies
- Applicable Sectors: Residential

- Amount: 30%
- Maximum Incentive: Solar electric: $2,000 for systems placed in service on or before 12/31/08; no maximum limit beginning in 2009.
- Solar water heating: $2,000.
- Fuel cells: $500 per 0.5 kW.
- Small wind: $500 per 0.5 kW, up to $4,000.
- Geothermal heat pumps: $2,000.
- Carryover Provisions: Excess credit may be carried forward to succeeding tax year.
- Eligible System Size: 0.5 kW minimum for fuel cells.
- Equipment/Installation Requirements: Solar water heating property must be certified by SRCC or by comparable entity endorsed by the state in which the system is installed. At least half the energy used to heat the dwelling's water must be from solar.
- Geothermal heat pumps must meet the requirements of the Energy Star program.
- Fuel cells must have an electricity-only generation efficiency greater than 30%.
- Authority 1: 26 USC § 25D
- Date Enacted: 8/8/2005 (Amended 2006, 2008)
- Effective Date: 1/1/2006
- Expiration Date: 12/31/2016
- Authority 2: H.R. 1424: Div. B, Sec. 106 (The Energy Improvement and Extension Act of 2008)
- Date Enacted: 10/3/2008
- Effective Date: 1/1/2008; elimination of the solar electric credit cap effective 1/1/2009
- Expiration Date: 12/31/2016
- Authority 3: IRS Form 5695 & Instructions: Residential Energy Credits

Summary:

Established by the Energy Policy Act of 2005, the federal tax credit for residential energy property initially applied to solar electric systems, solar water heating systems and fuel cells. The Energy Improvement and Extension Act of 2008 (H.R. 1424, Division B) extended the tax credit to small wind energy systems and geothermal heat pumps, effective January 1, 2008. Other key revisions included an eight-year extension of the credit to December 31, 2016, the ability to take the credit against the alternative minimum tax, and the removal of the $2,000 credit limit for solar electric systems beginning in 2009.

A taxpayer may claim a credit of 30% of qualified expenditures for a system that serves a dwelling unit located in the U.S. used as a residence by the taxpayer. Expenditures with respect to the equipment are treated as made when the installation is completed. If the installation is on a new home, the "placed in service" date is the date of occupancy by the homeowner. Expenditures include labor costs for on-site preparation, assembly, or original system installation and for piping or wiring to interconnect a system to the home. If the federal tax credit exceeds tax liability, the excess amount may be carried forward to the succeeding taxable year.

The credit is calculated based on the individual's expenditures excluding subsidized energy financing, which is defined as "financing provided under a Federal, State, or local program a principal purpose of which is to provide subsidized financing for projects designed to conserve or produce energy." Consumers who receive other incentives are advised to consult with a tax professional regarding how to calculate this federal tax credit.

The maximum allowable credit, equipment requirements, and other details vary by technology as outlined below.

Solar electric property

Maximum credit of $2,000 for systems placed in service from January 1, 2006, through December 31, 2008.

No maximum credit limit for systems placed in service from January 1, 2009, through December 31, 2016.

In case of joint occupancy, the maximum qualifying cost that can be taken into account by all occupants for figuring the credit is $6,667. This does not apply to married individuals filing a joint return. The credit that may be claimed by each individual is proportional to the costs he or she paid.

The home served by the system does not have to be the taxpayer's principal residence.

Solar water heating property

Maximum credit of $2,000.

Systems must be placed in service from January 1, 2006, through December 31, 2016.

Equipment must be certified for performance by the Solar Rating Certification Corporation (SRCC) or a comparable entity endorsed by the government of the state in which the property is installed.

At least half the energy used to heat the dwelling's water must be from solar in order for the solar water-heating property expenditures to be eligible.

The tax credit does not apply to solar water heating property for swimming pools or hot tubs.

In case of joint occupancy, the maximum qualifying costs that can be taken into account by all occupants for figuring the credit is $6,667. This does not apply to married individuals filing a joint return. The credit that may be claimed by each individual is proportional to the costs he or she paid.

The home served by the system does not have to be the taxpayer's principal residence.

Fuel cell property

Maximum credit of $500 per half kilowatt (kW).

Systems must be placed in service from January 1, 2006, through December 31, 2016.

The fuel cell must have a nameplate capacity of at least 0.5 kW of electricity using an electrochemical process and an electricity-only generation efficiency greater than 30%.

In case of joint occupancy, the maximum qualifying costs that can be taken into account by all occupants for figuring the credit is $1,667 per half kilowatt. This does not apply to married individuals filing a joint return. The credit that may be claimed by each individual is proportional to the costs he or she paid.

The home served by the system must be the taxpayer's principal residence.

Small wind energy property

Maximum credit of $500 per half kilowatt, not to exceed $4,000.

Systems must be placed in service from January 1, 2008, through December 31, 2016.

In case of joint occupancy, the maximum qualifying costs that can be taken into account by all occupants for figuring the credit is $1,667 per half kilowatt, not to exceed $13,333. This does not apply to married individuals

filing a joint return. The credit that may be claimed by each individual is proportional to the costs he or she paid.

The home served by the system does not have to be the taxpayer's principal residence.

Geothermal heat pumps

Maximum credit of $2,000.

Systems must be placed in service from January 1, 2008, through December 31, 2016.

The geothermal heat pump must meet the requirements of the Energy Star program which are in effect that the time the installation is completed.

In case of joint occupancy, the maximum qualifying costs that can be taken into account by all occupants for figuring the credit is $6,667. This does not apply to married individuals filing a joint return. The credit that may be claimed by each individual is proportional to the costs he or she paid.

The home served by the system does not have to be the taxpayer's principal residence.

6) U.S. Department of Energy - Loan Guarantee Program

- Incentive Type: Federal Loan Program
- Eligible Efficiency Technologies: Lighting, Windows, Roofs, Yes; specific technologies not identified
- Eligible Renewable/Other Technologies: Solar Thermal Electric, Hydroelectric, Renewable Transportation Fuels, Geothermal Electric, Fuel Cells, Offshore Wind, Manufacturing Facilities, Daylighting, Tidal Energy, Wave Energy
- Applicable Sectors: Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Agricultural, Institutional, Any non-federal entity
- Amount: There is no set limit, however the program focuses on projects with total project costs over $25 million.
- Terms: The term of an obligation shall require full repayment over a period not to exceed the lesser of 30 years, or 90 percent of the projected useful life of the physical asset to be financed by the obligation.
- Website: http://www.lgprogram.energy.gov

- Authority 1: 42 USC § 16511 et seq.
- Authority 2: 10 CFR 609

Summary:

Title XVII of the federal Energy Policy Act of 2005 (EPAct 2005) authorized the U.S. Department of Energy (DOE) to issue loan guarantees for projects that "avoid, reduce or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." The loan guarantee program has over $10 billion in authority to issue loan guarantees for energy efficiency, renewable energy and advanced transmission and distribution projects.

DOE actively promotes projects that fall within three general project categories: (1) manufacturing projects, (2) stand-alone projects, and (3) large-scale integration projects that may combine multiple eligible renewable energy, energy efficiency and transmission technologies in accordance with a staged development scheme. The loans guarantees are intended to encourage early commercial use of new or significantly improved technologies in energy projects. The loan guarantee program is not intended for research and development technologies.

The most recent solicitation for this program was issued on July 11, 2008. The deadline for applications under this solicitation is December 31, 2008.

To: File
From: U-City Legal Group
Date: October 20, 2008
Re: Federal Energy Efficient Tax Credits

MEMORANDUM

Federal Tax Credits

A selling point for this particular green homes development project includes energy efficient tax credits. As recently as October 3, 2008, President Bush signed into law the "Emergency Economic Stabilization Act of 2008" which included an extension of the residential tax credits (which had been in effect in 2006 and 2007) for energy efficient improvements. The previous tax credit expired at the end of 2007. The extension is for improvements made January 1–December 31, 2009. Improvements made in 2008 are not eligible for a tax credit. The following summarizes the tax credits available.

Home Improvements

Home Improvement tax credits are available for home improvements "placed in service" from January 1, 2009 through December 31, 2009. Any qualified home improvements made in 2008, are not eligible for the tax credit. Tax credits are available for insulation, replacement windows, water heaters, and certain high efficiency heating and cooling equipment is $500 during the three year period of the tax credit (2006, 2007 & 2009).

ENERGY POLICY ACT OF 2005 — SUMMARY OF TAX CREDITS FOR HOMEOWNERS

Product Category	Product Type	Tax Credit Specification	Tax Credit	Notes
Windows & Doors	Exterior	ENERGY	10% of	All ENERGY STAR labeled windows and skylights

	Windows and Skylights	STAR qualified OR meets IECC[1]	cost, up to $200[2] for all windows, skylights and storm windows	qualify for tax credit. o Installation costs are not included. o For tax purposes, save your receipt and either the ENERGY STAR label from all your new windows OR the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
	Storm Windows	Meets IECC[1] in combination with the exterior window over which it is installed, for the applicable climate zone	10% of cost, up to $200[2] for all windows, skylights and storm windows	Manufacturer Certification Statement[3] will list classes of exterior window (single pane, clear glass, double pane, low-E coating, etc.)[4] that a product may be combined with to be eligible in specific climate zones. o Installation costs are not included. o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
	Exterior Doors	Meets IECC[1]	10% of cost, up to $500[2]	ENERGY STAR doors will almost always qualify, except for certain parts of California[4]. Installation costs are not included. o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
	Storm Doors	In combination with a wood door assigned a default U-factor by the IECC[1], and does not	10% of cost, up to $500[2]	Eligibility will be confirmed by manufacturer and documented in the Manufacturer Certification Statement[3] o Installation costs are not included. o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695

		exceed the default U-factor requirement assigned to such combination by the IECC		o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
Roofing	Metal Roofs	ENERGY STAR qualified	10% of cost, up to $500[2]	All ENERGY STAR labeled metal roofs qualify for the tax credit. o Must be expected to last 5 years OR have a 2 year warranty. o Installation costs are not included. o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
Insulation	Insulation	Meets 2000 IECC & Amendments	10% of cost, up to $500[2]	o For insulation to qualify, its primary purpose must be to insulate. (example: vapor retarders are covered, siding does not qualify). o Must be expected to last 5 years OR have a 2 year warranty o Installation costs are not included. o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
HVAC	Central A/C	Split Systems: EER >=12.5 SEER >= 15 Package systems: EER >= 12	$300[2]	For a list of qualified products, go to the Consortium for Energy Efficiency product directory, click on the Air Conditioners and in the "CEE Tier" enter "Residential Tier 2." Note — not all ENERGY STAR products will qualify for the tax credit.

		SEER >= 14		ENERGY STAR specification: Split Systems: EER >= 11.5 & SEER >= 14 Package systems: EER >= 11 & SEER >= 14 o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
	Air Source Heat Pumps	HSPF >= 9 EER >= 13 SEER >= 15	$300[2]	Note — not all ENERGY STAR products will qualify for the tax credit. ENERGY STAR specification: Split systems: HSPF >= 8.2 & EER >= 11.5 & SEER >= 14 Package systems: HSPF >= 8 & EER >= 11 & SEER >= 14 o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
	Geo-Thermal Heat Pump	Same criteria as ENERGY STAR: Closed Loop: EER >= 14.1 COP >= 3.3 Open Loop: EER >= 16.2 COP >= 3.6 Direct Expansion: EER >= 15 COP >= 3.5	$300[2]	All ENERGY STAR labeled geo-thermal heat pumps qualify for the tax credit. o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.

	Gas, Oil, Propane Furnace or Hot Water Boiler	Furnaces: AFUE >= 95 Boiler: AFUE >= 95	$150[2]	For a list of qualifying products go to the Gas Appliance Manufacturing Association (GAMAnet.org) Note — not all ENERGY STAR products will qualify for the tax credit. ENERGY STAR specification: Furances: AFUE >= 90 Boilers: AFUE >= 85 o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
	Advanced Main Air Circulating Fan	No more than 2% of furnace total energy use	$50[2]	For a partial list of qualifying products go to the Gas Appliance Manufacturing Association (gamanet.org) o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
Water Heaters	Gas, Oil, Propane Water Heater	Energy Factor >= 0.80	$300[2]	Only some tankless water heaters currently qualify. This is over 33% more efficient than the current federal standard. o For a partial list of qualifying products go to the Gas Appliance Manufacturing Association (gamanet.org) o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. Use IRS Form 5695 Must be "placed into service" between Jan. 1–Dec. 31, 2009.
	Electric Heat Pump	Energy Factor >= 2.0	$300[2]	This is more than twice as efficient as the current federal

	Water Heater			standard. o Manufacturer's Certification Statement[3] required. o For tax purposes, save your receipt and the Manufacturer's Certification Statement. o Use IRS Form 5695 EXIT o Must be "placed into service" between Jan. 1–Dec. 31, 2009.
Solar Energy Systems	Solar Water Heating	At least half of the energy generated by the "qualifying property" must come from the sun. Homeowners may only claim spending on the solar water heating system property, not the entire water heating system of the household. The credit is not available for expenses for swimming pools or hot tubs. The water must be used in the dwelling. The system must be certified by the Solar Rating and	30% of cost, up to $2,000	Use IRS Form 5695

		Certification Corporation (SRCC).		
	Photovoltaic Systems	Photovoltaic systems must provide electricity for the residence, and must meet applicable fire and electrical code requirement.	30% of cost, up to $2,000	Use IRS Form 5695
Fuel Cells	Fuel Cells	Efficiency of at least 30% and must have a capacity of at least 0.5 kW.	30% of the cost, up to $1000 per kW of power that can be produced	Use IRS Form 5695

[1]Either the 2001 Supplement of the 2000 International Energy Conservation Code or the 2004 Supplement of the 2003 International Energy Conservation Code.

[2]Subject to a $500 maximum per homeowner for all improvements combined.

[3]A Manufacturer's Certification is a signed statement from the manufacturer certifying that the product or component qualifies for the tax credit. The IRS encourages manufacturers to provide these Certifications on their website to facilitate identification of qualified products. Taxpayers must keep a copy of the certification statement for their records, but do not have to submit a copy with their tax return.

[4]Additional information on exterior window features may be viewed at Anatomy of an Energy Efficient Window (http://www.energystar.gov/index.cfm?c=windows_doors.pr_anat_window)

Tax Credits for Home Builders:

Eligible contractors need to fill out IRS Form 8908 to get the tax credit. The IRS has provided the following guidance regarding the tax credits for constructing energy efficient new homes available under the Energy Policy Act of 2005:

IRS Notice 2006–27 -provides guidance for the credit for building energy efficient homes other than manufactured homes.
IRS Notice 2006–28 -provides guidance for the credit for building energy efficient manufactured homes.

Home builders are eligible for a $2,000 tax credit for a new energy efficient home that achieves 50% energy savings for heating and cooling over the 2004 International Energy Conservation Code (IECC) and supplements. At least 1/5 of the energy savings must come from building envelope improvements. This credit also applies to contractors of manufactured homes conforming to Federal Manufactured Home Construction and Safety Standards.

There is also a $1,000 tax credit to the producer of a new manufactured home achieving 30% energy savings for heating and cooling over the 2004 IECC and supplements (at least 1/3 of the savings must come from building envelope improvements), or a manufactured home meeting the requirements established by EPA under the ENERGY STAR program.

With the exception of the tax credit for an ENERGY STAR qualified manufactured home, these tax credits are not directly linked to ENERGY STAR. Therefore, a builder of an ENERGY STAR qualified home may be eligible for a tax credit but it is not guaranteed.

These tax credits apply to new homes located in the United States whose construction is substantially completed after August 8, 2005 and that are acquired from the eligible contractor for use as a residence from January 1, 2006 through December 31, 2009.

State Initiatives

Missouri Coalition for the Environment made note of the following State Green Building and Efficiency Bills in 2008:

- **HB 1863 Efficiency for State Agencies and State Buildings** (Rep. Judy Baker, D-25, Columbia) --Requires state agencies to engage in energy conservation and state buildings to meet the InternationalEnergy Conservation Code.

- **SB 1100, LEED for Public Buildings** (Sen. Joan Bray, D-24, St. Louis) -- Requires a state or local government building that is constructed or substantially renovated to be U.S. Green Building Council LEED certified. Allows exclusions from standards when the cost of compliance exceeds the expected energy savings.

- **SB 1117, Requirements and Incentives for Sustainable Buildings** (Sen. Jeff Smith, D-4, St. Louis) --This omnibus bill includes many provisions, including:

    - Individual Incentives:

    - **Green Building Tax Credit:** Allows a tax credit for taxpayers who construct a green building or modify an existing structure into a green building.

    - **Income Tax Deductions:** Income tax deduction of 50% of the cost of a home energy audit. Income tax deduction of 100% of the purchase of Energy Star labeled products.

    - **Show Me Green Sales Tax Holiday:** Dedicates April 19 - April 25 as a sales tax holiday during which all sales of Energy Star certified appliances will be exempt from state and local sales tax. (Also filed separately as SB 964).

MEMORANDUM

TO: U-City

From: Legal Group

Date: November 17, 2008

Re: Presentation-Alternative Financing Options

TIF: Facilitates the redevelopment of blighted areas by providing essential public infrastructure (See Memo)

CH. 353 Tax Abatement: available to for-profit "urban redevelopment corporations" organized pursuant to the Urban Redevelopment Corporation Law. Tax abatement under the Urban Redevelopment Corporations Law is extended to real property that has been found to be a "blighted area" by the city. **(**See Memo)

CDGB : See Aaron's memo

Brownfield Program : Provides financial incentives for the redevelopment of commercial/industrial sites that are contaminated with hazardous substances and have been abandoned or under utilized for at least three years.

Low Income Housing:

- **Green Multifamily Preservation Initiatives:** MHDC encourages developments that use sustainable building techniques and materials and will prioritize developments that utilize one of the recognized green building rating systems (e.g. Enterprise Green Communities, LEED-NC, LEED-H, EarthCraft, Green Globes, etc.) or become Energy Star certified.

Sustainable Communities & Transit Oriented Development Incentives: Missouri's 2009 QAP gives preference to projects which will be part of community development plans or which are located in D.R.E.A.M. communities or Qualified Census Tracts. A project's proximity to community amenities and ability to act as a catalyst for economic development or neighborhood revitalization will also be

considered in the allocation process.

Historic Tax Credits: fed and state tax credits are available for preservation and rehabilitation of historic buildings. Encourages investment in historic resources– in urban cores, residential neighborhoods and small towns throughout the state.

MEMORANDUM

TO: U-City

FROM: U-City Legal Group

DATE: November 17, 2008

RE: Green Resources

Green Resources Relevant to Preservation of Affordable Multifamily Properties

Source: National Housing Trust-http://www.nhtinc.org/documents/Green_Preservation_Resources_NHT_July2007.pdf

Missouri QAP (qualified allocation plan) Incentives: In the 2007 QAP, all development of rental housing must conform to the 2000 International Energy Conservation Prevention Act, HUD Guidelines for the Evaluation and Control of Lead-Based Paint in Housing, and the MHDC Energy Star appliances and guidelines are encouraged. "Other Environmental issues and concerns" are part of site- The plan also gives non-numerical priority for "implementation of solar and 'green building' design features."

Interesting website on *Environmental Benefits of Affordable Housing Preservation*: http://www.nhtinc.org/green_preservation_facts.asp

MEMORANDUM
December 4, 2008

TO: File

FROM: U-City Legal Group

SUBJECT: Community Development Block Grant

I. What is the Community Development Block Grant program?

Established by Title I of the 1974 Housing and Community Development Act, the Community Development Block Grant program represents a shift from the old policy of single purpose grants to a more flexible concept that allows recipients to expend funds on a number of local activities according to locally developed priorities. The grant monies may be spent on a number of activities enumerated in the Act.

II. Is the U-City Project Eligible to receive CDBG Funds?

Since the Act was amended in 1981, recipients are no longer required to file annual applications that listed needs and proposed priorities in order to receive funding. Now, grant recipients are required to submit to HUD an annual statement of program objectives and the projected use of funds. HUD then reviews these materials and allocates funds among cities and other eligible government entities (including St. Louis County) according to their proportionate need for urban aid. The local entity is then free to use the money for any eligible project it deems appropriate.

To be eligible to receive CDBG funds, a project must meet two basic criteria. First, 70% of the aggregate of the federal assistance provided to the project must be used for activities that benefit low and moderate income persons. Low-income persons are

defined as those making 50-60% of area median income; moderate-income persons are those making 60-80% of AMI.

The U-City project will not likely meet the 70% requirement. As it stands now, the RFP calls for the development of five market rate homes with a cost of around $200,000 each. This price is prohibitive for those making less than 80% of area median income. If the City were to re-tool the project to focus on providing housing for low- to moderate-income families, it would become eligible for the Community Development Block Grant and, possibly, other federal subsidies.

Second, Section 105(a) of the Act places limits on how the CDBG funds are to be used. Such monies are only to be used for the following activities: real property acquisition, public works facilities, code enforcement, clearance, demolition, removal, rehabilitation, disposition of property, architectural barrier removal, payments to housing owners for losses of rental income incurred in holding housing units for the relocation of families displaced by program activities. Further, up to fifteen percent of allocated funds may be used for public services, payment of the nonfederal share required in connection with a federal grant-in-aid program undertaken as part of assisted activities, completing urban renewal projects, relocation payments and assistance, developing a comprehensive community development plan, developing a policy-planning-management and administrative capacity, activities which are carried out by public or private nonprofits, economic development, energy conservation, housing rehabilitation, and limited new construction as part of a rehab project. Certain uses such as for government expenses and maintenance expenses are not eligible under the CDBG program.

Assuming that the project were to become eligible for CDBG funds, the City would have to be careful to use the money only for activities that fall under one of the allowable categories set forth above. For instance, U-City would not be able to use the grant money to actually construct the houses because that is not an allowable use. It may, however, use the funds to acquire other lots for the expansion of the program, demolish dilapidated structures, or improve public works facilities that serve the area. This could serve to significantly reduce costs, especially if the development were expanded to a much larger scale.

III. New CDBG Funds Under the Housing and Economic Recovery Act of 2008.

In 2008, Congress passed the Housing and Economic Recovery Act. Among other things, the Act made new CDBG funds available to state and local governments for redevelopment of abandoned and foreclosed homes and residential properties. Program funds are then to be treated like regular CDBG funds except that they may be used only for the following: 1) Establishing financial mechanisms for purchase and redevelopment of foreclosed homes; 2) Purchasing and rehabilitating abandoned or foreclosed homes in order to sell, rent or redevelop the property; 3) Establishing land banks for homes that have been foreclosed; 4) Demolishing blighted structures; and 5) Redeveloping demolished or vacant foreclosed properties. The law sets two limitations on purchases and rehabilitation of properties. Purchases must be at a price below market value. The selling price of a rehabilitated home to an individual as a primary residence cannot exceed the cost of acquiring or rehabilitating the home. Furthermore, funds cannot be used to benefit those making over 120% of the area median income (AMI) and at least 25% has to be used to fund projects that will benefit those making less than 50% of AMI.

IV. Is the U-City Project Eligible to Receive the New Funds?

Under this so-called Neighborhood Stabilization Program (NSP), St. Louis County will receive $9.3 million. According to Mike Jones, the County plans to use that money to confront two "priorities." First, the County would like to use the money to tackle problem properties. These are those small number of housing units in an area that tend to bring down an otherwise functioning neighborhood. Second, the money will be used to buy preferably large numbers of lots in areas with a high number of foreclosures that are adjacent to functioning neighborhoods. In both situations, the County would prefer to demolish the existing housing and build new, modern homes. If, for some reason, the properties cannot be demolished and must be rehabilitated, they must be made larger with modern amenities.

The University City LEED project, as the City has proposed it, does not fit neatly into either of the County's funding priorities nor the Federal guidelines for use of NSP funds. As with many of the other funding alternatives we have examined, the U-City project is not eligible because it does devote any of the project to housing for low-income persons. If the project were changed so that at least 25% of the funds would help low-income families, it would become eligible to receive NSP funding. Receiving the funds, however, is not a foregone conclusion. Even if eligible, a property does not automatically receive grant money. The County has the discretion to allocate the funds to those projects that it deems will best carryout and fulfill its priorities. This project, though, fits the priorities very well and, after some lobbying of the county administration, would likely receive some funding.

MEMORANDUM
December 4, 2008

TO: File

FROM: U-City Legal Group

SUBJECT: Title Search

Before beginning construction on the lots the City currently owns, or purchasing new lots for an expansion of the project, the City should perform a title search on each property. The search will identify easements, covenants, liens, and other title defects to the property and help avoid potentially costly mistakes in the future.

While the City is able to remove its own liens from the properties, encumbrances placed on the property by other entities (such as government, utility companies, and contractors) will continue to cloud the title. Often times, liens and judgments against the property can run into the thousands of dollars and make the title unmarketable. Other times, the only encumbrance is a utility easement along the edge of the property that causes no real problem. Performing a thorough title search and purchasing title insurance will give the city a heads up on any problems and allow the project to move forward. Whether or not a problem is found, the City will save money in the long run.

If the City were to build a new home upon property with an encumbrance of any substantial size, three things would likely happen. A bank would probably not be willing to provide a construction loan because it would not want its mortgage to be subordinate to the other interest. If it were to float a loan, the payoff amount would be included in the principal of the mortgage, thereby increasing costs. For the same reason, a contractor would not begin construction. His mechanic's lien would also be subordinant to the other

interest. If the home were finished, it would be difficult for the City to find a buyer because very few would buy a home with an unmarketable title. As a result, the City would have to pay it off, or otherwise take action to remove the defect, before a willing buyer could be found.

A simple title search at the beginning of the process would save the City time, money, and headaches. If an encumbrance to title were found, the City could redraw its plans for the project if it were an easement, negotiate with the holder of the interest for a lower payoff or, if neither of those options works, abandon the project before becoming too financially involved. On the other hand, if title to the property were not encumbered, then the City would have peace of mind knowing that no unexpected title issues will crop up and destroy the viability of the project.

MEMORANDUM
December 4, 2008

TO: File

FROM: U-City Legal Group

SUBJECT: Possible Ways to Encourage Green Building

A municipality committed to increasing the number of LEED certified buildings within its boarders may want to revise certain key provisions in its building code to encourage, or even mandate, green building practices. The paragraphs that follow highlight a number of potential building code provisions that will serve to meet the municipality's objectives.

I. Solid Waste and Recycling Collection

As part of the LEED certification process, an applicant may earn points by meeting certain requirements, such as reducing the volume of construction wastes taken to a landfill through reuse and recycling. Where a city requires builders to meet the requirements of LEED, green building becomes a much more viable option.

The City of Portland, OR has taken an interesting approach by including within its requirement that all businesses recycle, a mandate that all applicants for a building permit for projects with total job costs in excess of $25,000 must recycle certain materials generated on site as a condition of the permit.

University City could easily implement a similar provision in its ordinances. A mandatory recycling provision would help ensure that all projects that require a building code would be, in general, greener. The ordinance would also serve the secondary purpose of conditioning local developers and contractors to the LEED requirements. As

they become more comfortable with the idea, contractors would surely develop a more efficient process for sorting and disposal, thereby lowing costs and making LEED certified building more viable.

II. LEED Building Requirement

A second and more obvious way to encourage LEED building within a municipality is to pass an ordinance requiring all new buildings to meet a minimum LEED standard. For example in 2008, Pasadena, CA enacted an ordinance requiring certain types of buildings to meet, at minimum, a LEED Silver rating.

However, there are several potential problems that accompany the adoption of LEED certification as a building requirement. First, the public codes are subject to change by every decision of the U.S. Green Building Council, the organization that administers the LEED program. Second, LEED was established as a cutting edge program; whereas, building codes are intended to set a minimum standard for safety and other purposes. The compatibility of these two goals in the long run is still unclear. Third, there is no appeal for not meeting LEED standards, except through the USGBC. As a result, the municipality would have to innovate a completely new standard for adjustments, etc. Forth, LEED does not currently apply to all types of construction. For example, LEED for retail buildings is currently only in the pilot phase. Finally, the USGBC has only a limited capacity to certify new buildings. Currently the delay for certification is two months. If every building required USGBC approval, this delay would grow to enormous proportions.

To avoid these problems, a municipality may want to consider limiting the regulations to large buildings and developments. For instance, Pasadena has limited its

mandatory LEED certification to municipal buildings, non-residential buildings with 25,000 square feet or more of new construction, commercial buildings of 50,000 square feet or more, tenant improvements of 25,000 square feet, and mixed use and multi-family residential buildings four stories in height or more. These limitations relieve the average person of the strict LEED standards and the costs associated therewith. Instead, the requirements are focused on large developments, often the biggest polluters in a municipality.

III. Build LEED Certified Pilot Projects

Probably one of the best ways to encourage green buildings locally is for the city to build a LEED certified pilot project itself (like University City is doing here). Nothing motivates the private sector like money. A project that demonstrates both the economic viability of and demand for LEED building is sure to motivate local developers and contractors to fulfill the public's desire for green building services.

IV. Fee Rebates and Expedited Permitting

This recommendation is as simple as it sounds; rebating permit and other city fees and implementing a "quick start" permitting program for green building projects may be just enough to influence a developer to build a green building instead of a conventional one. The fees would be collected at the submission of the permit application like normal, but once the building is LEED certified, all fees would be refunded to the developer. These fees, however, are usually minimal and would not alone be enough to sway a developer toward a green project. This is where the expedited permitting process would help. Under such a regimen, the developer would submit an initial plan to the planning commission. The commission would review it and return it to with recommended

changes. The subsequent meeting, however, would be a face-to-face conference-style review of the final plan with all the reviewers, designers, and owners present. This process cuts out all the back and forth between developer and reviewers by having them sit down after the initial review and work out a plan that works for everyone. Developers would love this incentive because it cuts down on the massive investments of time and money that the review process normally requires.

Memo to the file: What is LEED certification?

The design, construction, and operation of buildings are key factors in achieving sustainable development. Better design, construction, and operation of buildings have the potential to have a material impact in curbing emissions of greenhouse gases, the main contributor to the global warming effect. Better selection of materials and better design can also reduce the demand for natural resources and reduce the amount of waste sent to landfills.

Green buildings are buildings that incorporate technologies and design features that allow them to use less energy, emit less carbon dioxide, generate less waste and utilize recycled and recyclable materials. These structures are more protective of occupant health while at the same time can improve employee productivity. High performing buildings use 20% less energy, as much as 40% less water and emit 25% to 40% less carbon dioxide than average conventional buildings.[1] Performance for the best green buildings may be 50% better than ordinary buildings.[2] LEED is a certification program for green building sponsored by the United States Green Building Council. LEED stands for Leadership in Energy and Environmental Design. There are currently 1,517 LEED certified buildings in the United States.[3] There are a number of other certification programs used in the United States, so the number of LEED certified buildings is not reflective of the total number of green buildings overall within the United States.

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[1] Green Building Returns Outweigh Costs, Ashley Katz, June 26th, 2008. Also see Green Building Costs and Financial Benefits, Gregory Kats.
[2] Energy Efficiency in Buildings, Business Realities and Opportunities, World Business Council for Sustainable Development.
[3] Hedging Bets on the Green Gamble, Addressing Risk in the Design, Construction and Operation of Green Buildings, Rodney Taylor.

Green buildings are different than conventional ones in several ways. Green buildings are designed, constructed, and operated to enhance environmental and economic performance while providing a healthy and aesthetically pleasing indoor environment. An integrated design approach that addresses several factors is used to evaluate and rate green buildings for certification programs such as LEED. These factors include site selection and development, water conservation, energy efficiency, use of renewable energy sources, indoor environment, air quality, use of renewable and recyclable resources, innovation in design and construction. Most green buildings in the United States that are formally certified as high performing use the LEED system of certification.

LEED has several rating categories that include certification for new construction, retrofitting of existing buildings, commercial interiors and building shells. LEED also provides certification for more specific categories such as residential homes, schools, and retail buildings. There are four ratings based on points awarded for a variety of construction features. There are some prerequisites that are mandatory. These prerequisites are erosion, sedimentation control in the site development category, minimum energy performance criteria and chlorofluorocarbon reduction in the energy and atmosphere categories, and minimum indoor air quality performance.

There are more benefits to LEED certified homes than just energy savings and lower emissions of greenhouse gases. High-performing buildings sold for a premium of 30% over non-certified buildings and were in strong demand even in a weakening real estate market.[4] Media attention on the global warming crisis has generated more interest in any way of reducing greenhouse gas emissions and using natural resources more

[4] Does Green Pay Off? Norman Miller, Jay Spivey, and Andy Florance, February 5th, 2008.

efficiently. Several states, counties, and cities have passed legislation requires all new public buildings in their jurisdictions to be LEED certified.[5] Several federal agencies have also mandated the use of high performing structures for all new facilities constructed or leased by these entities. There are also great incentives for private constructors to use green building and design. These incentives tend to include low interest loans, allowance for greater density of buildings, physical form of development approved, grants and tax rebates. There are also large pools of investment money earmarked for environmentally friendly projects.

[5] States that have already adopted or are considering mandatory green building statutes include: Arizona, Arkansas, California, Colorado, Connecticut, Illinois, Maine, Maryland, Massachusetts, Michigan, Missouri, Nevada, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Washington, and Wisconsin.
Counties that have enacted green building statutes requiring public buildings to be certified include Arlington County, VA, Cook County, IL, Dane County, WI, and King County, WA
Cities that require certification for public buildings include Austin, TX, Boulder, CO, Chula Vista, CA, Chicago, IL, Eugene, OR, Frisco, TX, Kansas City, MO, Los Angeles, CA, New York, NY, Portland, OR, San Diego, CA, San Jose, CA, San Francisco, CA, San Mateo, CA, Scottsdale, AZ and Seattle, WA.