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Rural  
Communities

HAC

# Rural Voices

THE MAGAZINE OF THE HOUSING ASSISTANCE COUNCIL

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## IT'S NOT HARD BUILDING GREEN



GREEN AFFORDABLE HOUSING IN RURAL AMERICA

## MESSAGE TO OUR READERS

Dear Friends,

The demand for green building in the affordable housing arena has encouraged tremendous growth in the development of new and improved sustainable techniques and products. This issue, which serves as a follow-up to the fall 2005 green issue of *Rural Voices*, focuses on recent trends in green affordable building and highlights some of the nonprofit rural organizations that have integrated sustainable design elements into their affordable housing projects.

Recognizing the advantages of green building, several communities and states have adopted local green standards for the development of affordable housing projects. In the "View from Washington" article, Congressman John Olver, Chairman of the House of Representatives Appropriations Subcommittee on Transportation and Housing and Urban Development, acknowledges the benefits of green affordable housing and expresses the need for a national housing policy that guarantees healthier, more efficient, and environmentally sustainable homes and communities.

While green building has become more accessible, the initial cost of investing in these techniques can still be a major obstacle for nonprofit organizations addressing the growing affordable housing needs of their communities with limited resources. The articles in this issue demonstrate how nonprofit organizations from diverse communities and climates have faced challenges, worked their way up the learning curve, and created tangible benefits for low-income residents and their communities at large. These success stories illustrate how a nonprofit may be able to integrate sustainable design elements and find its own unique shade of green.

The Housing Assistance Council's Green Building/Healthy Homes Initiative, with generous support from The Home Depot Foundation and Enterprise Community Partners, continues to promote the effective use of green building and healthy home technologies in affordable rural housing projects. Since 2005, HAC has awarded \$385,000 to over 30 nonprofit housing organizations, some of which are featured in this issue, for the development of green single-family and multifamily housing development, as well as housing rehabilitation. HAC looks forward to continuing our work with our partners to support current and future green building efforts in rural communities across the country.

Sincerely,



Lauriette West-Hoff, Chair



Debra Singletary, President



Moises Loza, Executive Director

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Cover photo courtesy of Rural Development, Inc.

# HAC Facts

NOTES ABOUT SOME OF THE RECENT ACTIVITIES, LOANS, AND PUBLICATIONS OF THE HOUSING ASSISTANCE COUNCIL

## HAC'S SHOP Borrowers Are Going Green

Many of HAC's 2007 Self-Help Homeownership Opportunity Program borrowers have included green building components in their projects. From Maine to California, these groups are incorporating green techniques that will protect the environment and often save homeowners thousands of dollars in the long term. Some examples of these projects are described below.

### **Burbank Housing Development Corporation Santa Rosa, California**

**Type of Project:** Single-family, 34-unit subdivision

**Green Building Techniques:** Homes are built to Build It Green Greenpoints Certification standards. Certification is based on a passive solar site plan and building orientation; use of drought tolerant, native plants; construction waste recycling; development near public transportation; and Title 24 energy efficiency that exceeds standards by 15 percent. Techniques also include vinyl-framed, dual-glazed windows, exterior doors with insulated form cores, ENERGY STAR rated appliances, and water-efficient plumbing fixtures.

### **Eastern Eight Community Development Corporation Johnson City, Tennessee**

**Type of Project:** Single-family, 6-unit subdivision

**GREEN BUILDING TECHNIQUES:** Eastern Eight CDC obtains ENERGY STAR certification for all homes. Other techniques include use of maintenance-free materials and high efficiency HVAC units, insulation of homes to the Model Energy Code, and inclusion of water-saving fixtures.

### **Neighborhood Nonprofit Housing Corporation Logan, Utah**

**Type of Project:** Single-family, 13-unit

**Green Building Techniques:** NNHC also requires ENERGY STAR certification for all homes in this project. Other techniques include water conservation; re-use of topsoil; installation of high efficiency toilets, showers, and faucets; insulated low-E windows; careful construction material ordering to reduce waste; and waste recycled into compost.

*~For more information on HAC's SHOP program, contact Brooke Adams at [brooke@ruralhome.org](mailto:brooke@ruralhome.org).*

*Continued page 4*



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## Green Building Peer Exchange Held In New Mexico

Recently, HAC brought together some of its rural housing partners to mentor each other on green building techniques. Tierra Del Sol Housing Corporation in Las Cruces, New Mexico and Tierra Madre in Sunland Park, New Mexico provided mentoring to peer exchange trainees from FUTURO Communities, Colorado Housing, Inc., and Habitat for Humanity of Alamogordo.

Tierra Del Sol, a regional community development organization whose construction activities promote the development of affordable housing, has built over 4,000 units of self-help housing in the last 30 years.

Tierra Madre, a community-based land trust, uses straw bale construction as an alternative method of developing a healthy community and providing affordable housing. Tierra Madre has built 24 units of affordable housing, eight of which were constructed using passive solar and the straw bale method.

Presenters at the exchange included Eugene Gonzales of HAC and Steve Cook of the University of Texas in El Paso. They provided information on “What is Green: Definition and Daily Practices” and “Green and the Environment.” Isaias Amaya from Tierra Del Sol explained how Tierra Del Sol is modifying its housing development plans to achieve LEED for Home’s Silver certification. Changes include installing duct systems in a temperature-conditioned area, adding R-38 insulation to attics, and installing Low-E windows to eliminate solar gain. The group travelled to Anthony, New Mexico, to tour Tierra Del Sol’s self-help units under construction. Attendees were able to see the green measures being installed and in place.

The group then traveled to Sunland Park, New Mexico where Tierra Madre staff demonstrated the use of passive solar and straw bale construction. The attendees toured the eight units under construction and ten other completed units. Attendees were able to see the difference between straw bale and stick built units.

Attendees reported that they had learned a great deal about green building measures that they will be able to take back and implement in their own self-help programs.

*~For more information on HAC’s technical assistance program, contact Jeff Mosley at [jeff@ruralhome.org](mailto:jeff@ruralhome.org).*

## Regional Experts Discuss Green Building At HAC Roundtable

As part of its Green Building/Healthy Homes Initiative, the Housing Assistance Council held a round table discussion on Green Building in Rural Communities in Holyoke, Massachusetts on August 11. At the roundtable, 22 regional experts emphasized the overall impacts of implementing green building practices.

The Green Building/Healthy Homes Initiative, sponsored, in part, by the Home Depot Foundation, is a comprehensive program of capacity building grants, training, and technical assistance activities to promote the incorporation of a “greener” approach to affordable rural housing development. The initiative is designed to promote the effective use of green building and healthy homes technologies in affordable rural housing by local housing developers.

*~For more information on HAC’s Green Building/Healthy Homes Initiative visit our website at [www.ruralhome.org](http://www.ruralhome.org) or contact Shonterria Charleston at (404) 892-4824.*

## HAC Conference Includes Green Building Track

Four workshops at HAC’s conference on December 3-5 in Washington D.C. will highlight themes in green building. We hope to see you there.

- **Rehabbing it Right: Effective Rehab for Single- and Multifamily Housing** will include an emphasis on new green rehabbing techniques.
- **Green Building in Rural America: Best Practices** will showcase several outstanding green rural housing development projects.
- **Funding Green Affordable Housing Development** will include presentations from funders on what they are funding and why.
- **Going Green on a Budget** will feature a discussion of low- and no-cost green development techniques for single-family housing development.

*~For registration information, visit [www.ruralhome.org](http://www.ruralhome.org).* 



# CURRENT GREEN BUILDING EFFORTS SHOULD BECOME FUTURE FEDERAL POLICY

By Representative John W. Olver

As Chairman of the House of Representatives Appropriations Subcommittee on Transportation and Housing and Urban Development, I am witness to the overwhelming need for affordable housing in our nation. In fact, the United States lost 1.2 million affordable housing units between 1993 and 2003. Meanwhile, three-quarters of households that are eligible for federal housing assistance by income level are not receiving it, and the demand for affordable housing is increasing as Americans age. We must look to address the great need for affordable housing by modernizing existing stock and creating new housing in a holistic way that makes good sense economically, environmentally, and for the health of the residents.


Numerous states and localities have already turned toward green building practices when addressing their communities' affordable housing needs. Not only do green buildings lessen the nearly one-quarter of our nation's total energy consumption and carbon dioxide emissions that are attributed to residences, they also make for healthier living environments. In addition, green buildings are solid investments. The small added construction costs can pay for themselves within five years because green homes are 30 percent more efficient than traditional homes. That means that low-income families and public housing authorities will reap the benefits of lower utility bills over the 50 to 100 year lifespan of the buildings.

Communities, both urban and rural, throughout the country are already benefitting from affordable green housing. For example, in my district, over the past 10 years Rural Development Inc., a nonprofit group based in Turners Falls, has been building affordable green homes in the most rural communities of the state. Their most recent project is quite exciting – a village of 20 near-zero net energy homes near the center of Greenfield, Massachusetts. A majority of these homes will be purchased by low-income buyers.

While momentum is building and success stories like RDI's continue to pile up around the country, the federal government has been slow to catch on. Prior to this year, not a single federal housing program required or encouraged green building standards in any meaningful way.

That is why in May 2007, I introduced the Hope VI Green Building and Technical Assistance Act (H.R. 3524) to begin to address this need. HOPE VI, a Department of Housing and Urban Development grant program, is designed to revitalize the nation's most severely distressed public housing. Passed by the House of Representatives on January 17 and again on September 16, H.R. 3524 requires that all new HOPE VI developments meet green building standards. Some specific criteria include locating new developments near public transit as well as promoting ENERGY STAR appliances, water conserving fixtures, and low volatile organic compound paint.

In addition to this legislation, I also requested that the Government Accountability Office analyze HUD's promotion of green building techniques and recommend further steps HUD could take to increase energy efficiency in federal housing programs. Released in September 2008, GAO's report shows that there are still many opportunities for improvement.

With the challenge of increasing the supply of affordable housing to meet demand for it, we are presented with a real opportunity. We have the chance to learn from the mistakes and successes of local and state green projects, and incorporate those lessons into the molding of a federal housing policy that thoughtfully and holistically builds healthier, more efficient, and environmentally sustainable homes and communities. 

*~Representative John W. Olver is a Democrat representing the 1st district of Massachusetts in the U.S. Congress.*

# GREEN AFFORDABLE HOUSING

## RETHINKING COSTS AND CAPITALIZING BENEFITS

By Ted Bardacke

As many American families struggle with rising costs for housing, energy, and health care, green building is becoming core to the mission of many affordable housing developers around the country. While the term is commonly used to describe a process of designing, developing, constructing, and operating buildings using sustainable methods and materials, for affordable housing developers green building is simply a way to provide healthy living environments for people and to reduce costs through the efficient use of energy and other resources.

### The Need for Green Affordable Housing

The negative impacts of conventional building practices are substantial. Buildings consume 76 percent of the electricity used in the U.S., making the building sector the largest greenhouse-gas-emitting sector, surpassing both the industrial and transportation sectors. The operation of buildings is also responsible for a large percentage of water use, and building construction consumes large quantities of wood and raw materials and generates a huge amount of solid waste. The manufacturing of many building materials contributes to air and water pollution.

Also, poor indoor air quality in buildings (resulting from a combination of mold and other biological contaminants, chemical off-gassing from toxic building materials and finishes, and poor ventilation) contributes to asthma and other respiratory problems, and can contribute to the development of long-term illnesses, such as cancer. Studies have shown a higher rate of asthma among low-income children and have identified a number of indoor environmental factors, such as mold and allergens, as asthma triggers.

Many of these impacts and problems are getting worse. Asthma rates have been increasing over the past couple of decades, and health officials estimate that at least 20 million people in the U.S. now suffer from asthma. Sprawling development patterns have increased the distance between housing and jobs for many people and have led to increased traffic congestion and air pollution.

Rising energy costs pose an especially serious problem for low-income households, as they usually have to spend a much higher percentage of their income on energy costs than higher-income households do, and this cuts into what they can spend on food, education, health care, and other critical needs. In 2008 low-income families will spend approximately 20 percent of their income on energy compared to 15 percent in 1997. Creating green housing is an effective way to address these types of issues and trends.

Sustainability is generally considered to have three main components: social equity, economy, and environment. Affordable housing addresses many of the social and economic aspects of sustainability, and the aim of green affordable housing is to integrate all three components. The primary goals of affordable housing development – to provide safe, decent, and affordable housing – are supported by green building. Green building simply adds another lens through which to view and meet these goals. For example, in addition to a low monthly rent or purchase price, the definition of affordability should also encompass low operating costs (e.g., energy and water bills), low maintenance costs, and proximity to public transportation when available (to reduce the financial burden of car ownership). The concept of safety should extend beyond physical security to encompass the provision of nontoxic, healthy living spaces. And, for a community to be strong, it

First Cost: The cost of building green without taking into account savings for the homeowner over the long term.

must be healthy, and its neighborhoods should be connected to the broader community and the natural environment.

## Rethinking Cost

While many green building strategies can be incorporated into a project at no or little additional first cost, most affordable housing developers do find that green building does cost more – at least in the short term. A recent study of green affordable housing costs by New Ecology Inc. shows the average first-cost increase in this building sector to be 3 percent.

However, thinking only about first cost is shortsighted. A home that is affordable to purchase but expensive to operate puts families at financial risk. A home that is cheap to build but includes toxic materials risks making families worse off through increased medical expenses. A home that looks good in the beginning but is not durable and rapidly deteriorates risks becoming substandard before a mortgage is paid off.

Other ways of looking at cost include:

- △ Life-cycle costing incorporates the expenditures necessary to maintain and replace part of a building by accounting for a material's durability in addition to first



Photo provided by Global Green USA.

Global Green is building a sustainable low-income housing community for New Orleans' ravaged Ninth Ward. The organization have just finished this single-family home and have four more to go — and an 18-unit apartment building.

costs. A material that is cheaper in first-cost terms may be more expensive from a life-cycle perspective.

- △ Payback factors in long-term operating savings and asks the question: How long does it take for the operational savings generated by a particular product or system to pay off the additional first cost? In the commercial real estate industry, acceptable levels of payback are usually around three years. In affordable housing, a decade or more is a common level of acceptable payback.
- △ Return on investment takes the concept of operational savings and extends it over the useful life of a particular material or building system. Once a more efficient system has “paid itself back” it continues to deliver savings over its useful life, often generating positive cash flow. Return on investment is a helpful metric because it allows for an “apples-to-apples” comparison of different green building measures in terms of their full economic impacts on a project.

While economic metrics do not capture all the benefits of green building, they are valuable tools to help developers and designers maintain discipline when evaluating different strategies, making choices and understanding what trade-offs are needed.

## Capitalizing Benefits

Many affordable housing developers are beginning to incorporate these additional perspectives on cost into their decision making processes. At the same time, there is often a mismatch between who invests in green building features and who reaps the benefits; this mismatch can often upset life-cycle, payback, and return on investment calculations because affordable housing developers investing in green building technologies often have little or no ability to recover their investments through higher sale prices or increased rents. As a result, the increased first cost of green features is often seen as taking money away from future development projects.


Overcoming this mismatch requires engaging in some additional financial gymnastics that result in an upfront capitalization of the lower long-term operating costs of a building. Capitalizing long-term savings is essentially a mechanism to borrow additional money for a project or a mortgage upfront and pay for the additional debt with the savings that a project will deliver over time.

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In a rental housing project, the most common ways of capitalizing operating cost savings are through adjustments to utility allowances and a reduction in maintenance reserves. New IRS regulations issued in summer 2008 allow for alternative methods of calculating utility allowances that result in a sharing of energy efficiency benefits between developers and tenants, thus increasing cash flow to support more upfront investment in a project (see Table 1). Similarly, investments in highly durable materials such as fiber-cement to replace vinyl siding can allow maintenance reserves to be lowered, thus freeing up cash flow to support additional debt.

In homeownership projects, lowering operating costs can increase the amount the purchaser can pay for a monthly mortgage while still staying within affordability limits. For projects using HUD mortgage guarantee programs, energy efficient mortgages are an acceptable method of recalculating a purchaser's "ability to pay" and can usually result in being able to fully finance the approximately \$4,000 in additional first costs necessary to build to ENERGY STAR standard in most states. For organizations that do their own underwriting and/or engage in self-help programs, accounting for lower utility bills can achieve a similar result.

### Conclusion

Affordable housing developers with experience in green building often find that each successive project gets easier to finance, while successively increasing long-term resident satisfaction and organizational pride. They rarely go back to older ways of doing business. It is undeniable that organizations building their first green projects face a substantial learning curve that can be stressful and make an already difficult development project more complicated. However, those obstacles are short-term and can be overcome with creativity and diligence. The benefits of building green – and the costs of a business-as-usual approach – last forever. 

	Maximum Rent	Maximum Rent w/ Reduced Utility Allowance
Area median income (AMI)	\$50,000	\$50,000
40% of AMI restriction	\$20,000	\$20,000
Monthly income	\$1,666	\$1,666
Maximum housing burden (30% of monthly income)	\$500	\$500
Monthly utility allowance	\$100	\$80
Actual maximum monthly rent	\$400	\$420

Cost	Amount	
HVAC System	\$500	
Structural materials	\$1,500	
Finish materials	\$1,500	
PV panels (for 50% of demand)	\$13,500	
Green building consultant	\$1,000	
Energy rater	\$750	
<b>TOTAL COSTS</b>	<b>\$18,750</b>	
<b>Equity offsets</b>		
	Source	
Appliance rebates	Local utility	\$110
ENERGY STAR home rebate	State energy agency	\$100
PV rebate	State energy agency	\$4,500
Green building grant	Local gov't/foundation	\$500
Federal tax credit for PV system	Federal gov't	\$2,000
<b>TOTAL EQUITY OFFSETS</b>		<b>\$7,210</b>
<b>Total increased costs minus equity offsets</b>		<b>\$11,540</b>

*~Ted Bardacke is Senior Associate in the Green Urbanism Program at Global Green USA, a national nonprofit environmental organization focused on sustainability and the built environment. Portions of this article are adapted from the organization's recent publication Blueprint for Greening Affordable Housing (Island Press, 2007). Global Green's work in affordable housing is supported in part by The Home Depot Foundation.*

# GOING FOR ZERO

## THE PROCESS OF DEVELOPING A NEAR-ZERO ENERGY HOME

By Anne Perkins and Wendy Forbes

After several years of gradually increasing its use of green building techniques, Rural Development, Inc. has finished its first near-zero energy house (a certified LEED-H home) in rural Franklin County, Massachusetts, and is now developing a village of 20 homes following the same principles. The following description of the process involved in designing and constructing that first house, known as the Colrain home, illustrates the methods, resources, and partnerships needed to accomplish comprehensive affordable green housing in the rural context.

In addition to the generous support of funders and partners, this house would not have been possible without the sweat equity of the homeowners, Adam and Megan, who helped build this home through RDI's self-help housing program. Self-help housing programs require participants to help with the construction of their own home, thus lowering the price and making it affordable.

### LEED-H Green Goals

RDI's primary goal for the Colrain project was to come as close as possible to achieving a zero net energy home – that is, a home with zero net energy consumption over the course of a year – while at the same time building an attractive home with a healthy indoor environment.

Local architect Bill Austin of Austin Design, Inc. had offered to design a home pro bono for RDI's homeownership program, and enthusiastically embraced the opportunity to make it a near-zero net energy home. At the same time, Steven Winter Associates came on board through the DOE Building America program, with equal enthusiasm, to design and monitor the mechanical systems.



Photo provided by Rural Development, Inc.

RDI's near-zero net energy home in Colrain a year after completion.

The Colrain house incorporates the full array of green building techniques, which are summarized below.

**Innovation and Design Process:** RDI's integrated design team for the Colrain home included not only the architects and engineers mentioned above, but also the future homeowners, a local utility company expert, RDI's staff carpenters, RDI's tradespersons (plumbing and heating contractor, electrician, insulator, photovoltaic installer), and RDI's professional staff. Other interested community members also provided input.

The plan was to build one near-zero net energy home as a prototype for building 20 additional homes in a planned development. This development, the Wisdom Way Solar

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Going for Zero *continued from page 7*

Village, is now under construction, with the addition of a landscape architect and a civil engineer on the team.

**Location and Linkages/Sustainable Sites:** Although a tenet of green building is to reduce transportation use by building in areas with public transportation readily available, this is not often an option in rural communities. Colrain is no exception. The owners must drive many miles to work.

Building in areas with existing public water, sewer, and electric services is also encouraged, so that more land is not taken up with private services. Again, however, this is not possible in most rural areas. The Colrain home has a private well and septic system.

RDI's Solar Village is being built in the small town that serves as the county seat. These public services are available in that setting.

**Energy and Atmosphere:** Working towards the goal of a near-zero net energy home, RDI incorporated many energy efficient practices in the house.

First, the home is sited such that the long axis faces south. Trees were cut to allow the sun to penetrate the south windows and solar systems.

Second, the home is very well insulated due to double wall construction techniques. This home consists of two 2x4 framed walls with off-set studs. This allows for a 12-inch insulation cavity and negates thermal bridging through the studs. The extra insulation keeps heat inside during the winter and outside during the summer, reducing the size of the heating equipment needed. Dense-packed blown-in cellulose insulation was used, since it provides high insulation quality as it fills the entire cavity with few gaps. It is also a recycled product. Added to the insulation, the home is sealed with a very tight air barrier to reduce any uncontrolled air leakage.

Third, very efficient triple pane windows were used with a U-value of .20. This is a crucial element of energy efficient construction, as a lot of heat can be lost through windows. These windows not only have low-E coating and Krypton gas, they also have foam-filled frames and sashes.

Fourth, the home is ventilated through very quiet continuously running exhaust fans. Ventilation is sized appropriately and then controlled.

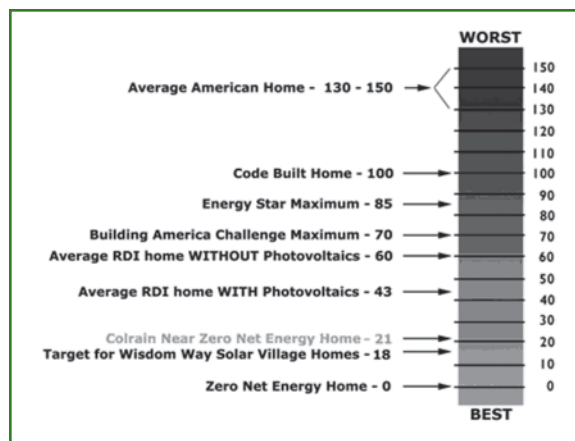


Figure 1: One good way to show what it means to get to "Near-Zero Net energy" is to use the Home Energy Rating System graph commonly used by ENERGY STAR home raters. The lower the number, the nearer the home is to zero.

Of these four basic elements, only the windows added significant cost, but they are well worth the expense. Additional elements employed in the Colrain home include ENERGY STAR appliances throughout the home and compact fluorescent lamps in all lighting fixtures. The CFL lights throughout the house are estimated to use 468 kWh of electricity per year, costing approximately \$79, compared to \$306 for conventional incandescent bulbs. An on-demand water heater was included as back-up to the solar hot water system. On-demand water heaters are more efficient in heating water than conventional tank water heaters because only the water that is actually used is heated by fossil fuel.

A key component of this near-zero energy house is the use of a photovoltaic system. Photovoltaic modules convert the sun's energy into electricity. The inverter converts the DC electricity from the photovoltaic panels into AC electricity to be used in the home. This home features 3.4 kilowatts of Evergreen Solar panels. In the first 12 months the family lived in the house, this system generated 3,373 kWh, providing 96 percent of the electricity they needed.

A three-panel evacuated tube solar hot water system donated by American Solar Works and the Western Massachusetts Electric Company generated 8,812 kBtu, providing 34 percent of the hot water needed for heat and domestic hot water during the first year.

**Water Efficiency:** This home incorporated an array of water efficient practices, including low-flow showerheads and fixtures, along with dual-flush toilets.

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# KEEPING ENERGY COSTS UNDER THE ROOF

## RADIANT BARRIER SHEATHING

By Pat Atkinson

Under the hot summer sun in Arkansas, Universal Housing Development Corporation construction staff could tell that radiant barrier sheathing was making an impact in the attic of the home they were building.

“You could really tell the difference just stepping under the garage roof,” stated Gary Jones, UHDC construction supervisor. He was skeptical enough to climb into the attic to see if the cooler temperature was due to the new decking. “It was cool – with the sun beating directly on it, it was cool to the touch!”

This is UHDC’s first experience with radiant barrier sheathing. Founded in 1971, the organization has built more than 1,122 affordable homes from 1976 to the present in its nine-county west central Arkansas service area.

### Radiant Barrier Sheathing

Radiant barrier sheathing is an engineered panel made by laminating a thin sheet of aluminum to oriented strand board. OSB has been used for many years as an alternative to plywood that is as strong and durable, but far less costly. It is also an environmentally sound choice since it can be made from low-value, small diameter trees that are sustainably harvested.

For energy efficiency, the addition of the aluminum sheathing makes all the difference. The aluminum sheathing reflects radiant heat away from the home and prevents solar heat gain, especially through the roof. The aluminum side of the sheathing is installed facing the attic. UHDC also uses the sheathing for roof decking and gable end sheathing.

Radiant barrier sheathing is installed in the same way as regular roof decking, so no special training is needed for contractors and subcontractors. It should be stored in a dry place until use, if possible, or covered and not allowed to rest on the ground if outside.



Photo provided by Universal Housing Development Corporation.

UHDC used radiant barrier sheathing to help insulate this home in Arkansas.

*Continued page 10*

Two of the more popular brands, TechShield® and Solar Board®, claim to reflect up to 97 percent of the radiant heat in the roof panel, significantly reducing the amount of heat radiating into the attic. In the summer, this can mean attic temperatures that average 20 to 30 degrees cooler than in other houses, and homes that are cheaper to heat and cool. That's good news for low-income homeowners who have been watching everything else become more expensive.

### Costs and Benefits

As its first home using this new material neared completion, UHDC was anxious to get some data on the savings the homebuyer family would realize on utility costs. In addition to feeling the cooler air and surfaces, the construction staff watched the difference in the speed of the attic turbines in the new home and in a nearby home constructed with regular OSB as decking. There was a noticeable difference in the rotation speeds, even before the new home was insulated.

Radiant barriers can save on a home's average monthly energy costs. The amount of savings depends on the design and construction of the home, the energy consumption of the household, and the outdoor temperature. A test conducted by LP® Building Products, which produces TechShield Radiant Barrier, found that a home constructed with TechShield, when compared to a home without radiant barrier, did in fact consume less energy. The average monthly energy cost savings increased with the average daily high temperature, resulting in 6 percent savings with average daily highs of 70 degrees, 13 percent savings with average daily highs of 80 degrees, and up to 17 percent savings when the average daily high was 89 degrees or higher. In the warm summer climate of Arkansas, UHDC's radiant barrier installed homes should save up to 17 percent in monthly energy costs.

Bill Tucker, UHDC self-help director, estimates that a family would pay about \$600 more in material costs to use the radiant barrier shielding instead of ordinary sheathing for



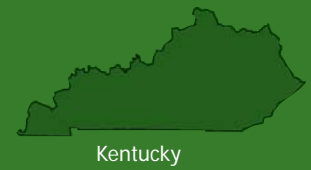
Aluminum sheathing reflects radiant heat away from the home and prevents solar heat gain, especially through the roof.

Photo provided by Universal Housing Development Corporation.

roof decking and gable ends. He is cautiously optimistic and withholding final judgment until his staff can take attic temperature measurements in finished homes for comparisons, but believes self-help families could save significantly in energy costs. "This could be the real deal," he says.

UHDC began using radiant barrier sheathing this summer after receiving a 2007 Housing Assistance Council Green Fund Capacity Building Grant. The grant allowed UHDC to incorporate this innovation in affordable new construction units without passing the cost on to low-income homebuyers. Based on what he's seen so far, Mr. Jones believes the technology would be worth adding to homes even if the client's initial costs did increase. 🌱

*~ Pat Atkinson is the Executive Director of Universal Housing Development Corporation located in Russellville, Arkansas. For more information, contact [universalthousing@uhdc.net](mailto:universalthousing@uhdc.net).*



Kentucky

# NOT YOUR GRANDFATHER'S TRAILER

## ENERGY EFFICIENT MANUFACTURED HOUSING

By Edna O. Schack

I'm riding with Josh Trent, Frontier Housing's Communities and Design Division Manager. We pull up over the newly cleared knoll onto the ridge and the October sky envelops us, magnifying the yellow and orange forested mountainsides visible in every direction. It seems as clear as the blue sky why Appalachian people choose to stay here despite the economic hardships of the region.

We've come to this eastern Kentucky ridge to chronicle the arrival and setting of Frontier Housing's first single section manufactured home, an ENERGY STAR qualified home built to Frontier's quality specifications at the Norris plant of Clayton Homes. While this plant generally builds only multi-section homes, they agreed to this single section venture after working with Frontier for several years to provide quality, energy efficient multi-section homes for the affordable housing market that Frontier serves. Up here on this narrow ridge, this single section fits perfectly.

Frontier Housing is a nonprofit organization with a 34-year history of providing safe, affordable housing in nine eastern Kentucky counties and the city of Ashland. In 2004, realizing a market demand, Frontier added the option of quality manufactured multi-section homes in addition to its line of site-built homes. All Frontier homes, whether

manufactured or site-built, meet rigorous standards of quality, energy efficiency, and aesthetics.

Frontier expects the single section manufactured home to address the housing needs of very low-income customers who once were a significant and successful part of Frontier's market, comprising 50 percent of their \$10 million loan portfolio with a foreclosure rate of less than 1 percent. Funding declines, rising housing costs and the lure of quick turn-around in obtaining a singlewide "off the lot" of the local mobile home dealer made it difficult for Frontier to meet the housing needs of this sector of the population – those with an income less than 50 percent of the area median income (AMI), in Frontier's service area, about \$12,000 annually.

This Frontier/Clayton single section offers multiple upgrades, but two that are key in allowing Frontier to serve this sector of the market are the FHA Title II foundation and the home's energy efficient features. The FHA Title II foundation qualifies the home as real property that is eligible for traditional mortgage loans rather than the high interest rate personal loans common with a singlewide product. With Frontier's ability to offer low interest home mortgages, these customers will be able to enjoy both efficient, affordable homes and affordable financing.

### FHA Title II Foundation

On the ridge, the Frontier crew has prepared the site, including the concrete, steel-reinforced footers and grid foundation, the first step in the FHA Title II permanent foundation system, for placement of the 1,165 square foot home. At 3:00 pm, the home arrives by Clayton transport at a designated location about a mile from its final site on the ridge. At this point, the cab is switched and a local transport

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Photo provided by Frontier Housing.

The first single section manufactured home built to Frontier Housing's energy-efficient specifications was completed and ready for occupancy less than two weeks after it arrived at its site.

## Not Your Grandfather's Trailer *continued from page 11*

company begins to negotiate the 76-foot long, shingle-roofed, vinyl-sided home along the last mile of winding mountain road. By 4:00 pm, the home is in position over the foundation, maneuvered by the transport team with greater ease than I can negotiate a parallel parking spot.

Within minutes, the team is dry stacking double block piers, the next step of the FHA Title II foundation. By nightfall, the wind-anchor straps will be wrapped and attached to the J-bolts embedded in the concrete foundation and the transport crew's job is complete. The next day Frontier's crew will continue work on the Title II foundation, further anchoring the home with a proprietary lateral resistance system. While the primary goal of the wind anchor straps is to keep the home firmly on the ground, this system protects the home against lateral sway from a variety of potential forces.

The final step in the FHA Title II foundation is a textured concrete block perimeter wall. With required venting and access door, this wall is not only aesthetically pleasing, but also contributes to the energy efficiency of the home, helping to maintain a clear crawl space where critters are less likely to intrude and compromise the ductwork. In addition, the ductwork is sealed in a tarped area, providing additional security against leaks. Leaky ductwork is a common problem in manufactured homes with open crawl spaces.

### Energy Efficient Features

Frontier Housing has always tried to balance the purchase cost of a home with ongoing affordability for the homeowner. To this end, this home is designed with ENERGY STAR energy efficient features. The primary energy cost-saving feature is the heating and cooling system. While the industry standard is generally an electric furnace and no air-cooling system, the Frontier model is cooled and heated with a 13 SEER (Seasonal Energy Efficiency Ratio)/7.7 HSPF (Heating Seasonal Performance Factor) heat pump.

To enhance the energy efficiency of the heating and cooling system, this single section has upgraded exterior walls and all envelope insulation. Exterior walls are all 2" x 6" with R-19 insulation in place of the industry standard of thinner walls with R-11 insulation. Floor insulation is R-22 in place of R-19. Instead of the standard mobile home ceiling, the Frontier specifications require R-30 batting.

Other Frontier energy saving specifications include oriented strand board, or OSB, wrap under the vinyl siding, upgraded roof decking, upgraded windows, and a programmable thermostat. All windows have been upgraded to double pane Argon low-E windows.

A tour through the home reveals other energy efficient features. Compact fluorescent lamps are used in most applications throughout the home. Just one CFL in place of a 75 watt incandescent bulb can save approximately \$9 per year at \$0.118/kWh (U.S. residential average) and four hours use per day. This may seem small, but when multiplied by five (just one CFL in each main room – kitchen, living room and each of the three bedrooms) it equals a savings of \$45 per year, a valuable amount to a homeowner whose income may be less than \$1,000 per month, not to mention the benefit of conservation to everyone.

With all energy efficient features factored in, overall energy costs are projected to be 34 percent lower in this Clayton single section manufactured home with Frontier Housing specifications and located in eastern Kentucky than in a standard single section. Frontier will monitor utility costs of this single section over the coming year to refine this estimate.

### Other Quality Features

The finished home is a spacious three-bedroom, two-bath home with a modern kitchen containing ample oak cabinets and a double stainless steel sink. In addition to energy efficiency and the Title II foundation, Frontier and Clayton have worked to make this home attractive. It has six-panel interior doors; crown molding; drywall in the main living area; fiberglass tubs, showers, and sinks, including a garden tub in the master bath; and levered locks on all doors.

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Photo provided by Frontier Housing.

Claude Simmons of Simmons Transport maneuvers the single section while Garret Ward of G & G Mobile Home Transport and Tom Lewis of Frontier Housing assist with guiding him.



# GREENING HOMES THROUGH BROWN DEVELOPMENT

## WATER CONSERVATION AND DROUGHT TOLERANT LANDSCAPING

By Allison Holmes

The Office of Rural and Farmworker Housing is a private nonprofit that provides comprehensive development services to private and public organizations throughout the state. Together, ORFH and its local partners have developed more than 1,100 units of housing, serving over 5,500 people. Many of these projects have incorporated sustainable elements that are selected based on regional needs and life cycle cost calculations. In the arid, high-desert climate of central Washington State, ORFH's usual attention to water conservation and other sustainable development issues becomes particularly important.

### Water Conservation in Royal City

In striking contrast to Seattle and western Washington, the mostly rural central part of the state receives only nine inches of rainfall annually. In such dry and arid areas, low impact landscaping takes on a different meaning.

A current example can be seen in ORFH's work with Catholic Charities Housing Services of Yakima, Washington. ORFH and CCHS are incorporating several low-cost water conservation techniques in the construction of Royal City Family Housing, a 51-unit development serving farmworker households in and around Royal City, Washington. Rural communities often lack community green space and ORFH attempts to strike a balance between low-impact development, providing green spaces for families, and maintaining the character of rural communities.

The Royal City Family Housing site is home to many mature trees, most of which have been retained and incorporated into the landscape plan. ORFH will also use native drought resistant plants such as Oregon green pine, reed grass, and alpine currant that will require little to no maintenance and have a tendency to thrive in this climate. This alternative type of landscaping is what many in central Washington call "brown development," as it resembles the natural desert environment of the region.

Other low impact development features will include underground, on-site disposal of storm water through the use of dry wells surrounded by geotech fabric, which will transport water to soils that more effectively drain and filter potential contaminants. The grading on this sloped site is designed in a way that prevents erosion both during construction and after occupancy.

We are also considering additional green landscape features such as rainwater re-use, permeable pavers, drip or bubbler irrigation for shrub beds, and additional native plants as supplementary, water-conscious elements of our landscaping plan. Parking areas of the development will be surrounded by grassy swales used to collect and convey storm water runoff, allowing pollutants to settle and filter out as the water seeps into the ground.

Interior features can also reduce the use of water, a precious resource in this area. Conservation strategies include low-flow toilets, high efficiency water heaters located near

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highest use, and ENERGY STAR rated appliances. These techniques are cost effective and add to the sustainability of the development as a whole.

### Costs and Benefits

According to the State of Washington's Department of Ecology, landscape watering and toilets use the largest amount of water in a home. In fact, as much as 40 percent of municipal water is used for outdoor irrigation in the summer and some homes consume as much as 3,000 gallons a day for outdoor use.

ORFH has found that investments in brown landscaping and water conserving appliances can successfully and significantly reduce water consumption. By using native, drought tolerant plants, water usage is reduced by approximately 43 percent. This, combined with the energy efficient appliances, reduces household water and utility

costs by 20 percent. For the average household, this could mean savings of nearly \$250 per year on utility bills.

The sustainable and efficient components of the development not only lower housing costs for low-income residents, but also reduce our dependence on water. We've found that the benefits and savings of these components outweigh the additional upfront costs. Moving forward, ORFH will continue to find more ways to incorporate green elements into our developments in the rural communities that we serve. 

*~Allison Holmes is a Housing Development Specialist at the Office of Rural and Farmworker Housing in Yakima, Washington. More information about the organization is available at [www.orfh.org](http://www.orfh.org). Rod Butler of Zeck Butler Architects also contributed to this article. More information on Zeck Butler Architects is available at [www.zeckbutler.com](http://www.zeckbutler.com).*


### Single Section Market

The 2007 American Housing Survey indicated that 6.3 percent of all occupied homes were manufactured/mobile homes, and that at least four of every five of them were not placed on permanent foundations. A study by Frontier Housing estimated that in their nine-county service region alone, one-third of the 15,000 manufactured homes on the ground are in deteriorating condition and in need of replacement. The vast majority of these manufactured homes are not placed on FHA Title II permanent foundations and they have inefficient design features. In some winter months homeowners' energy use can top \$500, and this figure is for a state where energy costs per kWh are well below the national average.

Frontier Housing has been surveying potential customers regarding the features they would give greatest priority when choosing a new home. Energy efficiency is consistently the first priority. With this single section manufactured home, Frontier Housing and Clayton Homes are offering energy efficiency that is unequalled in this market. In the words of Stacey Epperson, CEO and President of Frontier Housing, "this is a long-term investment in homeowner affordability."

The hard work, development, and potential of this endeavor is summed up by Kathryn Gwatkin Goulding of CFED,

an economic development organization that has worked with Frontier. "Frontier has forged a business-to-business relationship with Clayton Homes, the largest manufacturer in the country," Goulding says. "Frontier has set nearly 30 high-quality manufactured homes themselves, and, perhaps even more importantly, they have developed a model to serve as a broker to other nonprofit housing developers for Clayton products. This model is currently being tested with Frontier's sister organizations in Appalachia. Frontier, CFED, and our other partners believe it has promise as a model to be rolled out regionally or even nationally."

While economic hardships continue to challenge Appalachia and other regions of the country, Frontier Housing works to meet the challenge of providing quality and energy efficiency through the addition of this single section manufactured home to its line of homes. The cultural preference for remaining on family land in a single-family home is made more attainable through the efforts of this Frontier Housing project. 

*~Edna O. Schack is a professor at Morehead State University on sabbatical this fall with Frontier Housing in Morehead, Kentucky. More information on Frontier Housing may be found at [www.frontierhousing.org](http://www.frontierhousing.org).*



# COMPATIBLE, INNOVATIVE, SUSTAINABLE, AND GREEN RESPONSIBLE SITE DEVELOPMENT AND LEED NEIGHBORHOOD DESIGN

By Guy Thomas Kempe

Rural Ulster Preservation Company's Woodstock Commons is among the first developments in New York State for working families and seniors that is proposed to be certified in the Leadership in Energy and Environmental Design New Construction program, known as LEED-NC. It is also one of just nine projects in the state selected to participate in the LEED Neighborhood Development Pilot Program, known as LEED-ND, and qualified for gold level certification.

RUPCO, a nonprofit organization, works in a diverse community within the 20 townships, three incorporated villages, and one city located in Ulster County, New York. Located where mid-Hudson Valley meets the Catskill Mountains, the county includes the famous town of Woodstock, "Colony of the Arts."

Woodstock Commons will be a village scale development of clustered, mixed housing types on a 28-acre undeveloped infill site known as Bradley Meadows. The site, served by municipal water and sewer, is located steps away from the shopping district in the hamlet of Woodstock. This project includes 20 units of rental housing for seniors and 33 rental units for working families – a total of 53 units of green, intergenerational housing.

## Creating a Walkable Community

The innovative LEED-ND program is the newest green building rating system established by the U.S. Green Building Council, and was developed in partnership with the Congress for New Urbanism and the Natural Resources

Defense Council. Together these groups represent the nation's leaders among progressive design professionals, builders, developers, and the environmental community. Increasingly, the USGBC LEED programs have become the industry standard for municipalities and developers of affordable housing.

LEED-ND expands the green building certification program to encourage developers to incorporate sustainable elements into neighborhood design. To qualify, housing must integrate principles of smart growth with the most important green building practices.

For Woodstock Commons, as part of an effort to integrate the site plan with adjacent residential communities, RUPCO developed a Community Fitness Trail, Wetland and Habitat Interpretative Signage Program. Woodstock places a premium on interactive, social activities, and the growing popularity of outdoor recreation activities, combined with the loss of community open space, has increased the need for quality recreational facilities such as rail-trails, hiking paths, and exercise trails.

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Proposed buildings at Woodstock Commons are energy efficient, durable, and designed to reflect the community design aesthetic.



# SAVING ENERGY AND IMPROVING HEALTH WITH HVAC SYSTEMS

By Isaias Amaya

Tierra Del Sol Housing Corporation is including selection and installation of efficient heating, ventilation, and air conditioning systems among its green building techniques. The nonprofit, which for 35 years has served counties in Texas, New Mexico, and Arizona, primarily along the U.S. and Mexico border, recently completed a six-home pilot project using green building techniques in conjunction with the University of Texas at El Paso Energy Center and Southwest Energy Conservation, LLC.

This project was well accepted by the homeowners and Tierra Del Sol now plans to integrate green techniques into most of its building structures. In doing so, Tierra Del Sol will not only reduce energy consumption and decrease utility costs for homeowners, but will also create healthier homes and reduce environmental impact.

## Green Technique


The proper installation of an energy efficient heating, ventilation, and air-conditioning system reduces energy consumption and provides a healthy and comfortable indoor environment for residents. Tierra Del Sol is replacing old 80 percent energy efficient HVAC units with units that are 90 percent energy efficient or higher. ENERGY STAR quality furnaces are up to 15 percent more efficient than standard HVAC equipment required by code. Proper sizing of equipment, sealed duct work installation, and a well insulated home also play important roles in accomplishing the energy savings and improved indoor air quality expected.

The upgraded equipment is slightly more expensive, with an additional cost of \$400, or about 10 percent more than a conventional HVAC system. This increased price will be recouped through reduced monthly energy bills, however. Tierra Del Sol estimates that the savings for the

first year will be as much as 20 percent, which is \$200-\$400, depending on the homeowner's usage. The proper installation of an HVAC unit and upgraded features will also help with the maintenance of the home and contribute to a higher resale value.

These HVAC systems also play a major role in improving the indoor air quality of the homes through quality air filtration, distribution, and ventilation. This helps to reduce humidity, pollutants, and odors, all of which can contribute to poor indoor air quality. Poor indoor air quality has been ranked by the Environmental Protection Agency as one of the nation's top five environmental health risks and can trigger asthma, serious respiratory problems, and other ailments. By ensuring the proper installation and maintenance of the HVAC system, Tierra Del Sol is taking an important step to protect the health and well-being of our clients.

## Lessons Learned

In addition to upgraded HVAC systems, Tierra Del Sol has incorporated several other green building techniques. From our experience, we have found that the biggest challenge to building green is the increase in cost. The savings and benefits help to compensate, however. Tierra Del Sol staff continues to receive technical assistance from the UTEP Energy Center and continues to work with Southwest Energy Conservation, LLC, a company certified to perform ENERGY STAR ratings. Tierra Del Sol's goal is to implement the use of friendly environmental techniques on all our building structures to reduce the impact on the environment. 

*~Isaias Amaya is the Self Help Project Director at Tierra Del Sol Housing Corporation in Anthony, New Mexico. Additional information about the organization may be found at [www.tierradelsolhousing.org](http://www.tierradelsolhousing.org).*



Duct work is sealed with mastic inside & outside all Seams

Photo provided by Tierra Del Sol.

# LABELING EFFICIENCY

## ENERGY STAR

By Brian Ng

Energy efficiency is on everyone's minds lately. From higher gas prices to higher utility bills, people all over the country are feeling the pinch. Homebuilders are responding to this trend by increasingly constructing homes that incorporate a variety of energy-efficient features – such as high-efficiency heating and cooling equipment, high-performance windows, and energy-efficient lighting and appliances.

But how can homebuyers know for sure if the home they are buying is really energy efficient? By looking for the blue ENERGY STAR label.

### What is an ENERGY STAR Rated Home?

ENERGY STAR®, sponsored by the U.S. Environmental Protection Agency and U.S. Department of Energy, identifies new homes and over 50 different types of consumer products that meet strict guidelines for superior energy efficiency. To earn the ENERGY STAR, a home must be built to meet specific energy efficiency guidelines. This level of performance is verified by an independent Home Energy Rater.

ENERGY STAR qualified homes offer homebuyers all the features they want in a new home, plus lower utility bills and a quieter, more comfortable living space. At the same time, these homes help to protect the environment. That's because the energy used in our homes often comes from the burning of fossil fuels at power plants, which contributes to smog, acid rain, and global warming. So by using less energy, ENERGY STAR qualified homes reduce the amount of air pollution that is generated.

Nationwide, over 5,000 builders are constructing ENERGY STAR qualified homes and approximately 840,000 ENERGY STAR qualified homes have been built.

Homes that meet the ENERGY STAR guidelines, set by the U.S. Environmental Protection Agency, are at least 15

percent more energy efficient than homes built to the 2004 International Residential Code. Their additional energy-saving features typically make them 20-30 percent more efficient than standard homes.

### Extra Features, Extra Benefits

ENERGY STAR qualified homes achieve energy savings through established, reliable building technologies. Builders work with Home Energy Raters to select from a number of features when planning and building homes. These features include:

- △ **EFFECTIVE INSULATION.** Properly installed, climate-appropriate insulation in floors, walls, and attics ensures even temperatures throughout the house, less energy consumption, and increased comfort.
- △ **HIGH-PERFORMANCE WINDOWS.** Energy-efficient windows employ advanced technologies, such as protective coatings and improved frame assemblies, to help keep heat in during winter and out during summer. These windows also block damaging ultraviolet sunlight that can discolor carpets and furnishings.
- △ **TIGHT CONSTRUCTION AND DUCTS.** Sealing holes and cracks in the home's "envelope" and in duct systems helps reduce drafts, moisture, dust, pollen, and noise. A tightly sealed home improves comfort and indoor air quality while reducing utility bills.
- △ **EFFICIENT HEATING AND COOLING EQUIPMENT.** In addition to using less energy to operate, energy-efficient heating and cooling systems can be quieter, reduce indoor humidity, and improve the overall comfort of the home. Typically, energy-efficient equipment is also more durable and requires less maintenance than standard models.
- △ **LIGHTING AND APPLIANCES.** ENERGY STAR qualified homes may also be equipped with ENERGY STAR qualified products – lighting fixtures, compact fluorescent

bulbs, ventilation fans, and appliances, such as refrigerators, dish washers, and washing machines. These ENERGY STAR qualified products provide additional energy savings to the owner.

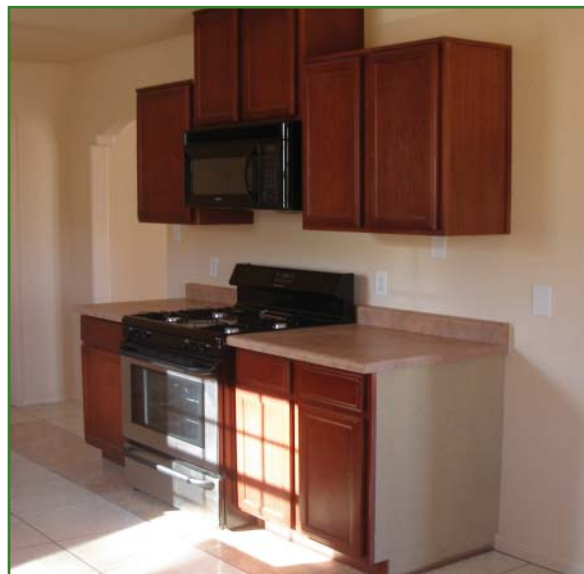
△ **THIRD-PARTY VERIFICATION.** With the help of independent Home Energy Raters, ENERGY STAR builder partners choose the most appropriate energy-saving features for their homes. Additionally, raters conduct onsite testing and inspections to verify that the homes qualify as ENERGY STAR.

ENERGY STAR has also added a new requirement called a “Thermal Bypass Inspection.” This inspection, which is performed by a Home Energy Rater, ensures that the home’s insulation is installed properly for maximum performance and that potential sources of air leaks in key areas are addressed by builders. Why is this important? Much like an unzipped winter coat, insulation will not work effectively if it isn’t used correctly. By making sure that this work gets done right, homebuyers can have greater assurance of the comfort they expect in an ENERGY STAR qualified home.

### Getting Started with ENERGY STAR

If your organization is interested in building ENERGY STAR qualified homes the first step is for your organization’s decisionmakers and those who will be involved in constructing the homes to review the information available on the ENERGY STAR website at [www.energystar.gov/homes](http://www.energystar.gov/homes). The second step is to contact a Home Energy Rater in your area. By conducting an evaluation of your construction process and home designs the Rater will be able to tell you how close to ENERGY STAR your standard construction practices are, including any prescriptive requirements you are missing, and make recommendations on what to modify so your homes will earn the ENERGY STAR.


Once you’ve decided on a course of action with your Rater, the next step is to build an ENERGY STAR qualified home, with your Rater providing the necessary inspections, testing, and verification. This process typically includes an inspection during construction before drywall is hung so the Rater can inspect items on the Thermal Bypass Checklist such as properly installed insulation. There is also a post-construction inspection that usually includes testing air leakage levels in the air ducts and for the house as a whole.



ENERGY STAR appliances in Tierra Del Sol home.

Photo provided by Tierra Del Sol.

If the house meets or exceeds ENERGY STAR’s energy efficiency guidelines, the Rater will apply a blue ENERGY STAR label to the electrical panel of the house. The Rater can also produce a home energy rating report that contains the documentation needed to prove that a home’s energy efficiency was verified for the ENERGY STAR label. The home energy rating report can be used by lenders in writing energy efficient mortgages for buyers of energy-efficient homes. An EEM is a mortgage that credits a home’s energy savings in the loan itself, allowing borrowers to qualify for a larger loan amount and a better, more energy-efficient home.

ENERGY STAR offers a partnership program for homebuilders. Partnering with ENERGY STAR distinguishes builders as leaders in energy-efficient construction and stewardship, providing valuable peer and public recognition that translates into market advantage because consumers increasingly ask for ENERGY STAR. More information about the benefits of becoming an ENERGY STAR builder partner is available at [www.energystar.gov/homes](http://www.energystar.gov/homes). 

*~Brian Ng is the Affordable Housing Outreach Coordinator for the ENERGY STAR Program at the U.S. Department of Energy. To learn more about ENERGY STAR qualified homes or to find a participating builder, Home Energy Rater, or lender, visit [www.energystar.gov/homes](http://www.energystar.gov/homes).*

**Indoor Environmental Quality:** To provide acceptable indoor air quality, this tight, energy-efficient home uses controlled mechanical ventilation to provide fresh air. Very quiet ENERGY STAR rated exhaust fans are installed in the bathrooms. These fans move air 24 hours a day at a low speed; the speed is increased during showering. The kitchen has a microwave/range hood vented to the outside to remove odors, combustion products, and moisture while cooking.

**Materials and Resources:** To minimize the home's environmental impact and maintain a healthy atmosphere inside the home, care was given to use local products, conserve natural resources, and use healthy materials wherever possible. The overall waste factor for framing lumber was kept below 10 percent, a requirement of LEED-H. Advanced framing techniques were used. Locally manufactured concrete with 30 percent flyash was used for the slab flooring, as well as for the foundation, because flyash reduces carbon emissions and the energy required to produce concrete. No carpet was installed in the home in order to prevent dust mites and mold. Low VOC paints were used. Finally, the cellulose insulation, key to the home's energy efficiency, is produced locally from recycled newspapers.

The small amount of waste lumber produced was taken home by one of the carpenters for use as kindling in his woodstove. Waste drywall, cardboard, and other biodegradable materials were taken by the homeowners to a special dumpster at RDI's office. A local farm recycled the dumpster's contents into compost. In total, 63 percent of the waste produced during the construction process was diverted in these ways.

### Lessons Learned

Among the lessons RDI learned through its Colrain house experience are the following.

- △ Near-zero net energy homes built with very low heat and cooling loads do not need expensive central heating systems. It is difficult to find such systems with a small enough BTU output.
- △ Many low VOC green building products are quite costly. If the home is properly ventilated, such products may not be the first priority in affordable housing.
- △ Ideal windows for northern climates have a low U value combined with a high solar heat gain and high visible light transmission. As most building in the U.S. is done



#### RURAL VOICES

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Photo provided by Rural Development, Inc.

The first duplex at the Wisdom Way Solar Village is nearing completion.

in southern climates, appropriate windows are more available in the south. It is not currently possible to find affordable low U value high heat gain windows.

- △ Including potential buyers in the early design process may cause concern about fair housing issues if such potential buyers are assured a home to the exclusion of others.

### Moving Forward


RDI has taken the lessons learned in the Colrain project and applied them to its newest undertaking, the development of the 10-duplex, 20-home Wisdom Way Solar Village in Greenfield, Massachusetts. As *Rural Voices* goes to press, the infrastructure is 90 percent complete and two of the duplexes are nearing completion.

Energy efficiency measures in the Solar Village are similar to those employed in the Colrain house. The biggest change is the lack of central heating. Because the heating load is so low, the houses are predicted to get most of their heat from their passive solar features.

The challenge of finding windows suitable to northern climates was overcome by using two different types. On the southern walls, RDI is installing windows with a relatively high solar heat gain coefficient but a higher than desirable U value. This allows as much solar gain as possible. The thick walls keep the cold out and the heat in during the winter. The windows on the eastern, western, and northern exposures, which get almost no or no direct sun, have even higher U values, but their solar heat gain coefficient is lower. Super insulation and this system of highly efficient windows

will prevent heat loss so the houses will remain warm and cozy with very little, if any, auxiliary heat. On extremely cold days, heat will be provided by a thermostatically controlled natural gas fueled space heater in the main living space of each house.

This village, modeled on a typical New England village, will have 13 homes for buyers with low incomes, five homes for buyers with moderate incomes, and two homes to be sold on the open market. Two homes will be rented to people with disabilities and are completely accessible. All of the homes are visitable by people in wheelchairs.

Thus the Wisdom Way Solar Village is a mixed income, mixed ability, near-zero net energy “green” community. 

*~Anne Perkins is Director of Home Ownership Programs and Wendy Forbes is Home Ownership Programs Assistant at Rural Development, Inc. Additional information about the organization may be found at [www.ruraldevelopmentinc.org](http://www.ruraldevelopmentinc.org)*

### Project Financing

As is the case with most affordable housing projects, Rural Development, Inc. received funds or services for this project from an array of sources, including:

- △ Adam and Megan’s sweat equity labor and mortgage
- △ Austin Design, Inc.
- △ American Solar Works
- △ Center for Ecological Technology
- △ DOE Building America Program
- △ Greenfield Cooperative Bank
- △ Home Depot Foundation
- △ Housing Assistance Council
- △ Massachusetts Technology Collaborative
- △ Paradigm Windows
- △ The Life Initiative
- △ U.S. Department of Agriculture Rural Development
- △ Western Massachusetts Electric Company
- △ Massachusetts Department of Housing and Community Development
- △ HUD’s Self-Help Homeownership Opportunity Program and American Dream Downpayment Initiative program

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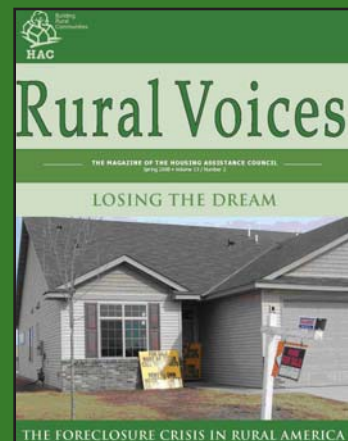
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