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# Green Building

DIRECTORY 2014

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## On the Cover:

A licensed general contractor, carpenter and interpretive planner, Dan Clere and his family have made it their mission to inhabit a net-zero home. Through an array of planning their dream has become a reality in their new Asheville residence. Garret K. Woodward photo (See related article, page 20)

The 2014 WNC Green Building Directory is dedicated in memoriam of Daryl Rantis.

It is with deep sadness and a heavy heart that we say goodbye to our friend and colleague Daryl Rantis.

Rantis passed away suddenly in March 2014 and leaves behind his wife Jennifer and two children, Cece and Camille. Daryl served the WNCGBC for many years as a board member and a volunteer. As his dear friend David Tuch eloquently

wrote, "Daryl didn't just build buildings, he spent his life building community."



Daryl was committed to creating vibrant buildings and places that touched people's souls. He was very much a part of the smart growth,

new urbanism, and green building community, and dedicated both his time and his expertise to the Green Building Council. Daryl was so much more than an architect helping build people's homes – he was a cook, a comedian, an artist, good friend, husband and, most importantly, a father.

And though Daryl is no longer living, he will reside in our hearts, and in that way his life is not finished. Life truly characterizes Daryl, and he will live on in the hearts of all who knew him.

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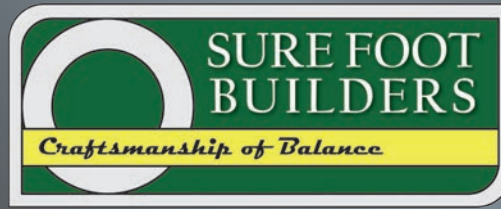
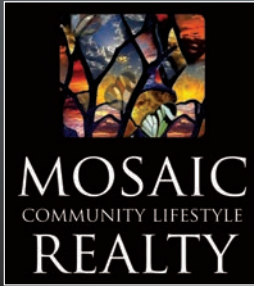


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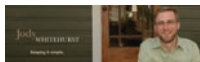
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WESTERN NORTH CAROLINA GREEN BUILDING COUNCIL



# Welcome to the directory

This year the directory is a partnership between the WNC Green Building Council and The Smoky Mountain News. The publication is a primary tool for education, outreach and expansion of the green building industry in Western North Carolina. It provides a free, non-biased resource of the latest information on green building to the general public and building professionals.

The articles in this publication span the range of very technical fact sheets for professionals to case studies and green building "basics" to help homeowners get started building or renovating a home. Within these pages are your keys to successful green building projects.

For those of you ready to take that next step and either build a new green home or green your existing home, the business listings will connect you with the many great local companies that are greening WNC each day.

Over the past 13 years, the WNC Green Building Council has made incredible strides in expanding the knowledge about and implementation of green building in our region through certification of

over 900 new homes, organizing monthly green open house tours, creating new programs for existing homes and educating the public in many ways.

The council also offers a free hotline for your questions, many on-line resources and provides assistance through its many programs. If building new, the WNCGBC can help you through the process of certifying your home through Green Built or LEED-Homes. If renovating, consider our new Green Gauge Assessment tool. As a membership supported non-profit organization, the WNCGBC has been able to serve the community thanks to our business and individual members' continued support.

We hope that you find the Green Building Directory a valuable resource and support its continued publication through membership with the WNCGBC.

## How to use the Guide:

This guide has something for everyone. The articles in the front of the guide include case studies of regional projects both in the residential and commercial settings, feature articles on a variety of themes in green living and technical articles on emerging technologies for professionals.

In the back of the guide, you will find a vast directory of local green businesses that are there to help you live a more sustainable life. There are specific requirements for many of the business categories in an effort to keep high standards and provide a truly valuable resource.

Of course the guide – both current and archived articles from past issues – is always available online at [www.wncgbc.org](http://www.wncgbc.org) just in case you accidentally lose the hard copy.

– Maggie Leslie,  
Director WNCGBC



## An overview of WNCGBC

The Western North Carolina Green Building Council (WNCGBC) is a membership supported, 501C3 non-profit organization whose mission is to promote environmentally sustainable and health conscious building practices through community education. The WNCGBC began as a casual gathering of five building professionals in the spring of 2000. A common desire to educate others on the health and environmental impacts of design and construction led to the official formation of the council in 2001. Throughout its existence, WNCGBC has educated thousands of building professionals and homeowners by providing building science and weatherization trainings and has worked with local governments and utilities to provide training and incentives for green buildings.

The WNCGBC hosts classes and events throughout the year to teach builders, architects, realtors, and the general public how they can build green, sell green, and live in green homes. The primary and most valuable educational tool the WNCGBC produces is this annual Green Build-

ing Directory, a resource guide and directory of professionals. The Directory is available online and distributed throughout WNC. The on-line directory and website also includes articles, a blog, industry news, "how-to" videos and links to many resources around the web.

The WNCGBC also administers the Green Built NC Home Certification Program. Green Built NC is a voluntary, statewide program that aims to educate and provide third party quality assurance that the home is built to green construction standards. Similar to Green Built, but national in scope, the WNCGBC is also a provider for LEED-Homes, a national green building certification program of the U.S. Green Building Council.

Our newest program is Green Gauge. This simple and affordable tool assesses how "green" a home actually is and is open to both new and existing homes. Participants receive a one-page "Gauge" highlighting the green features of the home and illustrating how the energy and indoor water use of the

home compare to average homes in the region.

In 2013, the WNCGBC began hosting the Living Building Challenge Collaborative-Asheville. The Living Building Challenge certifies buildings that are net-zero energy, net zero water, have locally sourced materials and zero red list chemicals.

Buildings are responsible for 39 percent of annual carbon emissions, 65 percent of waste, 12 percent of water use and 71 percent of electricity use in the US. Not only do green building techniques help the environment, they also save money and protect health by reducing toxic chemicals, providing adequate ventilation and promoting more durable materials in the places where we live and work. The WNC Green Building Council offers a free hotline for your questions, many online educational resources and provides assistance through its many programs. If building new, the WNCGBC can help you through the process of certifying your home through Green Built NC or LEED-Homes. If renovating or buying consider our new Green Gauge Assessment.

Become a member online at [www.wncgbc.org](http://www.wncgbc.org).

## 2013 in Review Accomplishments of the WNCGBC:

- Hotline – Answered over 150 hotline questions for the general public. Most common questions were on financial incentives, business referrals, permeable pavement, financing and appraisals, natural building and codes.
- Certified 147 homes through LEED Homes and Green Built NC, saving over 26,685 pounds of coal and \$44,100 on utility bills.
- Launched a monthly education series: "Green Built Applied" for hands-on continuing education.
- Quarterly classes to On Track Financial, empowering homeowners to understand weatherization and how to save money on utilities.
- Annual networking event at Highland Brewing with over 350 attendees – raising money and providing networking for our members.
- 25,000 copies of the WNC Green Home and Living Guide distributed throughout Western North Carolina with business listings and educational articles.
- Monthly tours of homes and businesses open to the public and free of charge.
- Monthly social events.
- Established a local collaborative for the Living Building Challenge – a Net Zero Energy, Net Zero Water, Zero Waste building program.
- Weekly blog posts by local experts.
- Hired Nina Zinn as Development and Outreach Coordinator to provide more educational and networking opportunities for the members and the general public.
- Partnered with Asheville Green Drinks on quarterly educational programming.
- Cider Fest NC – our first annual Cider Fest NC fundraising event sold out. The event featured local cider makers, cheese makers, music, green building tours and activities for kids.
- Our organizations membership grew for the first time since 2008.
- New SEO optimized, mobile-friendly website integrated with the directory listings.
- Launch of new Green Gauge Platform – assessments for new and existing homes.





# Out of the car, into your world

□ BY GARRET K. WOODWARD □

It's another sunny day in downtown Hendersonville, but David Hazzard has other reasons for the smile on his face.

"I've really enjoyed this project, it's been a positive experience," he said, gazing down Main Street. "Day in and day out I see the effects of this project – it's pretty amazing to see how far it's come in the last decade."

Senior project manager for Luther E. Smith & Associates PA (LSA), Landscape Architecture/Land Planning firm, Hazzard has spent the better part of the last decade working on improving the aesthetics and viability of downtown.

"What we wanted to do was make downtown more vibrant, more pedestrian-friendly, to make it work better in all scenarios of everyday life, and also make it flex-

ible for parades, outdoor markets, art installations and other events," he said.

For decades, Main Street in Hendersonville was your typical downtown, with two opposing lanes of

Luther E. Smith & Associates, working with the City's Engineering Department, were brought in to change all of that.

"In the [new design], we felt the pedestrian should come first. There

LSA employed numerous traffic-calming measures, including bulb outs to decrease crosswalk distances, street trees to slow cars, and mid-block brick cross walks. They also wanted to open up down-

"In our downtown setting, it's about the pedestrian and the pedestrian experience. It's not just about the car."

— David Hazzard, Luther E. Smith & Associates

traffic and parking. A curvilinear street was added in the 1970s, to help revitalize it after many shops had relocated to malls and commercial highway corridors as had happened in most Main Streets around the country.

This original design served the city well, but the street-scape along with aging utilities were in need of an update and upgrade. So in 2007,

are plenty of highway corridors in the region, state and country. In our downtown setting, it's about the pedestrian and the pedestrian experience. It's not just about the car," Hazzard said. "We designed for the pedestrian and allowed for the car, as opposed to a design for the car [and traffic] with the pedestrians an afterthought."

In planning out their design,

town, let the space breathe and move, where pedestrians can not only move about freely, but are also encouraged to spend as much time as possible enjoying their downtown experience.

One of the first major changes was to remove numerous large brick planters lining Main Street. Though they held vegetation, they were more cumbersome and a



waste of prime useable space. Hazzard looked at their removal as creating more opportunities for the pedestrian gathering spaces.

"We took out the planters and made each [space] into a plaza, where you now have tables, chairs and benches. Prior to that, the space was there, but it had this large object right smack in the middle making it unusable," he said. "Main Street before had outdoor dining seating, but no real congregation space. There are now places to just sit and read the newspaper if you want, and the furniture is moveable to allow for maximum flexibility, street performers and festivals."

The creation of the open-air plazas included several green building/streetscape initiatives. One of those was to increase the urban forest and increase the focus on native vegetation. Purple cone flower, black-eyed susan's, rhododendrons, itea's, clethra, fothergilla, oakleaf hydrangeas and switch grass were planted in the plazas, while trees like red maples, fruitless sweetgum and honey locust created bosque shady areas.

Within those bosque-designed plazas (a geometrical organization of trees), the trees within tree grates and up-lights became the highlight. Purposely placed in the plazas to create "outdoor rooms," the trees grow up and out exponentially in a short period of time (usually five to seven years), ultimately providing a natural outdoor ceiling for pedestrians wanting to sit, cool off and soak in their surroundings.

**Project manager:** Brent G. Detwiler, City of Hendersonville  
Engineer, [cityofhendersonville.org](http://cityofhendersonville.org)  
**Landscape Architect:** Luther E. Smith & Assoc. PA, Hendersonville,  
[lsadesign.biz](http://lsadesign.biz)  
**General Contractor:** Trace & Company, Inc., Mountain Home,  
[traceandcompany.com](http://traceandcompany.com)  
**Landscape Contractor:**  
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"In an urban environment, the soil tends to be poor and compacted. So, we also used a structural soil mix in the planting pits, a granular mix, which allows water and air to get to the roots of the trees, increasing their overall health and growth while reducing sidewalk up-heave from the roots," Hazzard



Luther Smith (left) and David Hazzard of Luther E. Smith & Associates PA along with the City of Hendersonville, just finalized a seven-year project that renovated and revitalized Main Street in downtown. The senior project manager, Hazzard and his team implemented numerous green initiatives into the layout, which included more pedestrian-friendly crosswalks, shaded seating areas and stormwater collection (opposite page). Garret K. Woodward photos

said. "Stormwater is also being directed to the soil mix, so it's naturally filtering the water and slowing it down before it enters a perforated pipe and connects to the city's stormwater system."

LSA created entry nodes at the intersection of Main Street and 6th and 7th Avenue (U.S. 64), which included up-lit dogwood trees and signs constructed out of recycled, historic granite curb stones and Hendersonville's logo cut out of Corten steel. Six circular raised brick planters for future art were designed within the plaza areas, as well as a small raised stage that could accommodate performances but would function as seating for everyday use.

Encouraging residents and visitors alike to wander and immerse themselves in downtown, the new design also called for connectivity to nearby neighborhoods and parks. Since LSA's design, 4th Avenue, which intersects Main Street, became Hendersonville's first street with Shared-Lane Markings to increase cyclist safety. Fourth Avenue

connects downtown to Jackson Park, one of the largest public green areas in the Henderson County, and the Oklawaha Greenway. Bike racks were installed on Main Street, and there are hopes for more bike lanes as the need increases.

The downtown design also points out the future possibility of the Ecusta Rail Trail, following the railroad line going from Hendersonville to Brevard. The 18-mile trail is still in the planning stages, but if made a reality, would open up a whole host of multi-modal transportation and recreational opportunities to connect into.

"The rail trail would create a multi-use path that would connect Hendersonville and Brevard and all of the communities in between," Hazzard said.

Design studies have shown how large residential areas in the city are within a five- to 10-minute walk from downtown. Hazzard noted one of the biggest pieces in the revitalization puzzle was how to simply get people out of their cars, relying on them less, and instead go walk

or bike to and from Main Street.

Strolling Main Street, Hazzard points out every detail of the downtown design. As a landscape architect, he is proud of how this project has made Hendersonville more of a destination, with pedestrian-friendly spaces, aesthetically pleasing lush native landscapes, and an overall expanding vibrant community. Where once there was silence and emptiness when the sun went down, now there's live music, the aroma of restaurants, and the excited voices and faces of people participating in a growing, vivacious community.

"I'll come out here and go for a walk on my lunch break and it's just incredible to see the progress of downtown Hendersonville," he said. "I've been working here for 10 years, and back then you'd never really see anybody out past five or six o'clock. Now, you can go out any night of the week and people of all ages are out everywhere. There are a number of factors in the city's growth, with the [new] streetscape being a major one."





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# New Belgium

A behind the scene look at making a sustainable site for the brewery

The greenway corridor with the brew house and liquid center. Perkins + Will illustration

■ BY DAVID TUCH ■

When it's all is said and done, New Belgium Brewing will be making a \$150 million investment in Western North Carolina. The account of how New Belgium made the decision to build their east coast facility in Asheville provides valuable insight into the development of the site. In this case, the making of a sustainable site starts with New Belgium and the City of Asheville.

This is really a story of how a community whose focus on sustainable development helped attract a business that has sustainability as a core value. Let's start off by saying that New Belgium could have very easily picked a much easier location to build; instead, they selected a Brownfield Site along the French Broad River very visible from the highway crossing over the river. New Belgium wanted to find a place to support their environmental focus as well as their bike culture, after all the bicycle is part of New Belgium's brand identity.

Jenn Vervier, New Belgium's Director of Strategy and Sustainability, said that in the fall of 2010, "New Belgium determined the brewery should be on the East Coast and

developed a matrix of more than 30 critical factors it would consider in its search". These included work force, a progressive culture, Brownfield Redevelopment opportunities, and proximity to a population center with a vibrant downtown.

Using this matrix, they narrowed the search to a dozen cities it would visit in the summer 2011, ruling out all those that did not have plans, zoning, or the infrastructure that would allow their co-workers to bike or walk to work. Asheville was one of the few finalists that met this key attribute along with Richmond, Va., and Philadelphia, Penn. When it came time to make the final selection, as Jenn Vervier tells it, "I just got the sense of like-minded people who believe in sustainable development and investing in the community."

With sustainability being at the forefront in the decision to ultimately select Asheville as the location to build their East Coast Brewery, there was going to be a focus on sustainable development of the site itself. But to do this, a partnership with the City of Asheville to develop the site was forged. Several of the sustainable design features of the project are being implemented by the City of Asheville as a result of New Belgium

Brewery's investment in the development of the property along the river. Key improvements include the low impact parking lot, greenway, Craven Street enhancements, stream restoration and some of the stormwater treatment areas that are part of the City's long-term investment in the revitalization of West Asheville and the River Arts District.

From the beginning it was clear that the City of Asheville and New Belgium wanted this project to be a showcase for what it really means to develop a site based on an environmentally sensitive design approach. Now there is no getting around that the property is in the floodplain, and for a number of reasons it is best not to adding impervious surfaces in floodplains. In the perfect scenario then the site would be just outside the floodplain.

However, after New Belgium completes the site redevelopment, there will be less impervious surface in the floodplain than there was before. And in terms of redevelopment of a previously impacted and underutilized piece of land, this is a terrific site to reclaim for use along the French Broad River as opposed to the alternative of developing a site that is undeveloped and in a natural condition.

What is perhaps most exciting about the project is that there is equal emphasis on making a sustainable site as there is on green building practices. The building will include many materials that were salvaged during demolition of the existing facilities and subsequently adapted for re-use in the brewing facility and the Liquid Center – the place for you and me to drink beer. But the site (the campus grounds) will also be something very special.

Given the emphasis put on visitors and co-workers to be able to walk and bike to work, it shouldn't be a surprise that Greenway & Multimodal Transportation Improvements are a major focus of the project. New bus shelters will be provided along Haywood Road. Craven Street will get bicycle lanes, on-street parking, and sidewalks. A section of the French Broad River Greenway will also be constructed through the New Belgium Brewing site which will be connected via a greenway extension to the French Broad River Park, Carrier Park and Hominy Creek Park, providing the single longest greenway in Asheville when complete. A connection to the West Asheville neighborhood from the greenway will also be built and in the future, this section of the

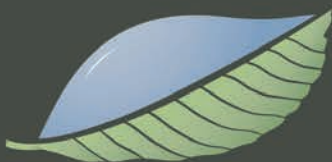


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greenway will connect across the river to the Wilma Dykeman Riverway and the miles of greenway and multimodal improvements planned for the other side of the river.

A Low Impact Parking Area & Trailhead for the greenway and for additional City of Asheville parking needs will also be constructed at the northern terminus of the greenway and adjacent to the brewery. This trailhead as envisioned will be one of the main access points for Asheville's greenway system along the riverfront. The parking lot itself will include porous pavers to allow stormwater to infiltrate directly into the ground instead of running of into the French Broad River and has been appropriately called the Low Impact Parking lot.

Early in the process (back in 2012) a design workshop was conducted with the multidisciplinary team of design consultants hired by New Belgium to turn their vision into reality. During the workshop a strong emphasis was placed on creating a Leadership in Energy & Environmental Design (LEED) certified project and providing design solutions to help avoid impacts to natural systems. The environmental design professionals including the team's landscape architects developed ways to completely avoid impacts to an existing stream and wetland on the property. A highlight of this is the use of an arch culvert to span the a creek, avoiding impacts from construction altogether

while providing needed parking for New Belgium employees.

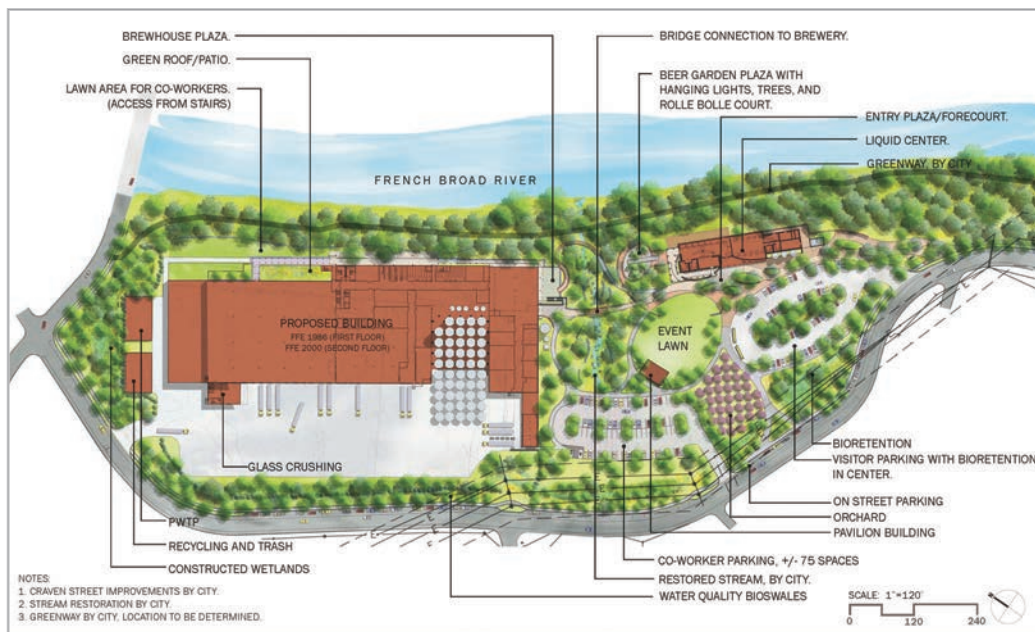
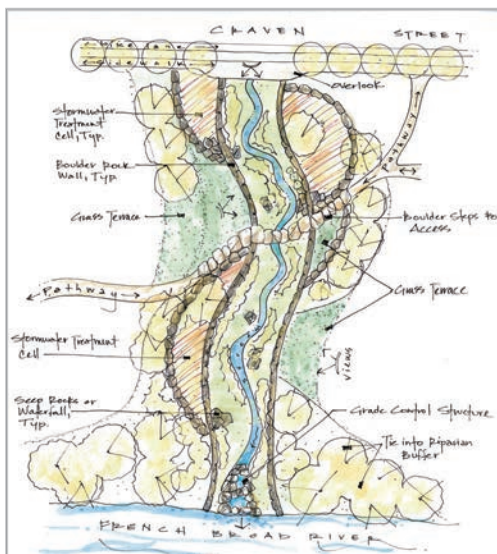
When it comes to water – critical to making good beer – the emphasis on clean water continues. A stream literally cuts the property in half. This degraded stream will be restored and include native plants that typically grow along a streambank and the creation of a stream channel with rock structures to help stabilize the streambed and streambanks while providing habitat. This will create a little mini ecosystem that will be recreated around the center of the site.

All of the parking areas and

A concept for the stream restoration.

Equinox  
Environmental  
Consultation &  
Design

Master Plan of  
the site. (below)  
Perkins + Will



the road and the site. The “green street” includes bio-retention areas and porous pavers for the on-street parking areas.

The final environmentally sensitive features of the site are the plants themselves. While due to legal reasons, edible plants are not part of the flora that will be planted, you may recall that this is a Brownfield's site, there has been a focus on the use of Native Pollinator Friendly Plants for honey bees. Asheville is a designated Bee City USA community focused on the preservation and rejuvenation of honey bees and New Belgium's landscape will help with this effort. The native plants selected from the region will support not only honey bees but other pollinator's species as well.

One of my more memorable interactions with the New Belgium contingency visiting from Fort Collins, Colo., was when they used superlatives to describe how “lush, green and awesome” our vegetation is in North Carolina. We have a wide diversity of plants and it sometimes takes someone visiting Asheville to remind us of this. This diversity of plants has been applied to the landscape design features of the site.

Whether you are a beer drinker or not, one thing is clear – Asheville's emphasis on sustainability providing clean water, bike paths, and a cultural emphasis on environmental concerns, is paying off in a significant fashion. It helped attract a company to make a \$150 million investment – after an in-process adjustment to the building footprint design in 2013 – in our community. This doesn't include the jobs it has already started to create, estimated by the Asheville Chamber of Commerce to pump an additional \$41 million into the community. Through the partnership with New Belgium Brewing and the City of Asheville as well as others, this development will enhance the riverfront and provide a model for sustainable development of a site. So, anyone who says sustainable development doesn't work or costs too much may want to reconsider that position.

*David Tuch along with several of his co-workers are a member of the Design Team working for both New Belgium Brewing and the City of Asheville providing sustainable site planning & design services. He is a Landscape Architect and the President of Equinox Environmental Consultation & Design, Inc.*

# Building a better future

□ BY GARRET K. WOODWARD □

When Boone Guyton moved to Asheville in 1991, "There wasn't a green building movement." But, Guyton knew he was somewhere that could potentially lend itself to more energy efficient building and forward-thinking ideologies.

"When we moved here most of the green building was being done by the early adopters and the back to the land movement. There was not an organized push to get green building into the mainstream" he said. "But, it seemed that there were a lot of folks that would bend towards green building if they were made aware of it."

A founding member of the Western North Carolina Green Building Council, Guyton and his wife, Claudia Cady, operate Cady & Guyton Construction, which is based out of Alexander. In the 13 years since the inception of the WNCGBC, the green energy and green building initiatives in the region have grown exponentially, with Southern Appalachia becoming a hub for net-zero building and renewable energy technologies.

"It makes sense in hindsight how big green building is around here," Guyton said. "This area attracts progressive-minded folks, entrepreneurs, artists and creative-minded people."



Growing up in south-central Connecticut, Guyton learned basic woodworking and tool skills from his father. He then moved to middle



Located on Trade Street in the River Arts District of Asheville, this home was built by Cady & Guyton Construction. The structure features solar panels, rainwater collection and a high-efficiency water pump. Garret K. Woodward photos

Tennessee as part of the "Back to the Land" movement of the late 1960s/early 1970s, where he learned from scratch how to build, and build efficiently, from other skilled carpenters and engineers.

"I got into the movement and bought a farm in Tennessee," he smiled. "I didn't have much money, so I had to do things myself, and I

plete one housing project. For 2013-2014, they built a Platinum Certified Green Built NC home on Trade Street in the River Arts District of Asheville.

On a small hillside property overlooking the district, Guyton emerges from the home and walks down the driveway with a welcoming hand extended. A warm Ap-

month, we made 85 kilowatt hours more than the house used. In a good month, a cooler one like September, we'll make more of a surplus to be available in winter when there will be a deficit in production and overflow."

Stepping into the three-bedroom, two-bathroom house, one notices an immediate temperature

"It makes sense in hindsight how big green building is around here. This area attracts progressive-minded folks, entrepreneurs, artists and creative-minded people."

— Boone Guyton

started building and doing my own carpentry work."

Eventually, he and Cady packed up and headed for Asheville, in search of new opportunities.

Nowadays, Cady & Guyton Construction specializes in building green homes and structures. Each year, they design, build and com-

palachian summer sun radiates above, with Guyton all smiles as he points to the numerous solar panels on the roof of the 1,200-square-foot structure.

"We have a net-metered [solar] system, where overflow goes into the grid, and you get paid for what excess you have," he said. "Last

drop, where the summer heat has been replaced with a nicely shaded, cool living room. Guyton points out intricate details around the rooms and nooks, where his wife, a skilled woodcrafter, handmade the cabinets and detailed trim. The wood was harvested from a nearby lot in West Asheville the couple





One key feature of the kitchen is the handmade cabinets, with the material coming from wood harvested from a lot in West Asheville.

cleared for another project.

In addition to the solar panels, the home also boosts a rainwater collection system and has a high-efficiency heat pump water heater (HPWH), which collects heat from inside the building and transfers it into hot water, thus also helping keep the building cooler in the summer.

"The heat pump water heater is twice as efficient as a regular electric water heater" Guyton said. "When it runs it takes the heat out of the air and puts it right into the water."

The walls of the home are Ideal Precast concrete, which provides for a waterproof, airtight and well-insulated structure. Guyton noted the walls are R-20 when set by the foundation contractor with additional insulation added onsite. While building codes require R-15 for walls and R-38 for ceilings, the Trade Street structure is R-30 in the walls and R-60 in the ceiling. Guyton figures the entire project, including land, building supplies, permits, labor and miscellaneous items, cost around \$180,000 and should cost very little monthly to operate.

"We're always trying to build them in a more affordable, efficient way," he said.

But, even with his ever-evolving homes, Guyton and his wife feel there's more to be done, more innovations and ideas that will bubble up to the surface on the green building industry.

"That's what I like about green building – there's always something new coming," he said. "The next big thing I think will be energy storage, where solar panels produce energy and store it, which can help the grid out because the energy

can be used when it's needed, not just when it's produced, making it a lot more efficient."

When asked why folks should take a hard look at green initiatives for their own homes and future housing projects, Guyton takes a glance at the newly built Trade Street property, with his gaze heading across the way into the mountains of Southern Appalachia.

"[Green building] saves money right now, and savings are only going to increase because energy

**Construction:** Cady & Guyton Construction, boone.guyton@gmail.com

**Electric:** Jon Fedock Electrician, Leicester, angleslist.com

**Plumbing:** Sacchi Plumbing & Gas, Candler, angleslist.com

**Solar:** Solar Dynamics, Asheville, solardynamicsnc.com

**HVAC:** Gentry Heating, Inc., Asheville, gentryheatinginc.com

**Insulation:** Home Energy Partners, Asheville, homeenergypartners.com

**Energy Rater:** Vandemusser Design, Asheville, vandemusser.com

**Roofing:** Ogburn Repairs, Sylva, facebook.com/ogburnrepairs

**Framing help:** Rare Earth Builders, Canton, rareearthbuilders.com

**Building supplies:** Builders FirstSource, Asheville, bldr.com

**Excavation:** Jeff Kegler

costs are only going to increase. As far as the nuts and bolts of it all, it's a good thing to do," he said. "Environmentally, buildings are 40 percent of greenhouse gases in the United States. So, if we're going to address climate change, buildings are one of the things we've got to do better."

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# Our path to net-zero

One family's effort to live their truth

□ BY DAN CLERE □

**M**y wife and I have chosen to prioritize our home as the lynchpin of our effort to live more sustainably.

It is hard to overstate the impact our homes have on the amount of coal and gas we burn. Our homes can greatly exacerbate our dependence on dirty energy or help free us from it. It can lessen our dependence on automobiles or make it worse. Our homes can contribute energy to the grid by casting the largest solar electric net ever from our rooftops or be energy sucking vampire boxes, cold and alone when their constant supply of fossil energy is interrupted.

I realize that "net-zero" is a misnomer on many levels.

While our house generates more electricity than it consumes, it enjoys abundant amounts of solar energy that should not be ignored. Regardless, the best journeys are ones where the end is not clear or even

possible to attain. Our primary reason for walking a path to net zero is love for our children. We deliberately choose to create a better world, not passively create a worse one. Because our energy choices are so inextricably linked to so many qualities of our world, we choose to champion a sun powered home over all others. By keeping this our guiding principal and inspiration, we have achieved difficult goals shared by many.

Like any path, ours comes from somewhere and goes somewhere else. It comes from a culture and lifestyle where intense waste is the default setting and it goes where our home and all its energy use is far closer to our daily allotment of sunshine.

Rather than ignore and even suffer from solar energy, we live in a home that "works" with sun-driven energy flows to both heat and cool our home. Cool nighttime breezes and shade trees are just as much a

product of solar energy as the heat we feel on our skin.

The result of this ancient cosmic design is that our home is exceedingly comfortable throughout most of the year without any electricity being used for heating or cooling of the living space. By opening and closing windows as needed our home stays between 65 and 75 degrees Fahrenheit most days of the year. On cold winter nights we enjoy our wood stove (with an outdoor air supply kit).

The orientation of our windows and their eaves/awnings not only means that the shortest day of the year is the brightest in our home, or that the longest day of the year is the shadiest, but that we have a front row view of the moon and stars, a legitimate need for some big picture windows, and the drama of the outdoors plays constantly from our "box seats." Our home's comfort comes from its systematic relationship with the pulse of natural rhythms.

Here I'll point out some simple design considerations that have allowed us to build such a nest:

■ In shaping our home like a caterpillar shapes its chrysalis, we allow breezes to flow unimpeded around the conditioned space. During the winter this aerodynamic lack of 'inside corners' and minimal surface area means our home's warmth is less challenged by the outside world. During the shoulder seasons we crank out operable casement windows that use the home's shape to "scoop" in heady breezes. Our open central stairwell promotes the "stack effect." During the height of the cooling season, this means we open our floor level casement windows just above the exposed foundation slab along with our bedroom windows upstairs. Throughout the night, cool mountain air flows in across our slab and relatively warmer air from the house blows out our bedroom windows.





Located on the edge of the Pisgah National Forest just south of downtown Asheville, the Clere house is the realization of a dream for contractor Dan Clere and his family (left). Of its many green initiatives, the structure is built in the shape of a caterpillar (above) to allow for unimpeded air flow and also has an outdoor living space to conserve energy used inside (below).



In the morning we close everything up and our home stays in the low to mid-seventies all afternoon despite 90-degree highs outside.

■ By wrapping the exterior sheathing with an inch of rigid foam we stop much of the heat transfer that otherwise would occur through conduction in our wood frame. By eliminating this “thermal bridge” our house maintains comfortable indoor temperatures despite changing conditions outdoors. It also helps that we framed with 2x6 studs 24” on center. This meant a larger surface area is covered with deeper insulation with fewer wood-framing members in contact with the exterior sheathing.

■ By locating our home on a lot previously cleared for and occupied by a single-wide mobile home, we built what is considered “infill development.” This means that rather than clearing native woods for a new home we replaced an energy hog with a small solar plant.

■ We limited the square footage of our house by giving spaces redundant purposes. For instance, our mudroom is also an isolated solar-gain space, an airlock, a traffic pattern connector/divider, and firewood storage. We wired a bedroom to have all the functionality of an office so that most days of the year we can work in it while certain other days we give it over to guests as a comfortable bedroom. Even things as simple as accommodating a comfortable couch in our open kitchen/dining space so we don’t feel the need to have a family room in addition to the living room. All of these design considerations result in our house “living large” while keeping our conditioned space to a minimum (1,650 square feet).

■ My favorite aspect of our home is the outdoor living space, particularly our 250-square-foot screen porch. This space is full of bird song and breeze and allows us to spread out most of the year into an outdoor space where we stay dry and don’t get bitten. While we enjoy this space more than any other in our home, we’ve never wasted a watt of electricity heating or cooling it. It’s the ultimate in comfort and the least energy intensive space in our home. We use it as both dining and living space.

■ With our small 3.77 kW solar electric system, we generate more solar electricity than we consume of grid power. This surplus pro-

duction is a crucial milestone on our path. We blow up our own mountains to get at their coal seams for the same reasons a crack addict robs a gas station – we feel like we need it and we don’t consider the consequences, just give us our “fix.” Our solar photovoltaic panels free us of this addiction. The grid actually accepts and sends to our neighbors the extra solar fired electrons we generate. Because our home’s electricity demand is so low we only need to generate between one and two dollars worth of electricity per day to offset all of our consumption. This “small is beautiful” energy budget allowed us to afford our PV system. By doing so we’re forcing our electric utility to become an energy manager rather than an energy generator – let the revolution begin.

**Designed by:** Owner  
**Electric:** Buckingham Electric  
[www.buckinghamelectricinc.com](http://www.buckinghamelectricinc.com)  
**Solar:** Sundance Power Systems  
[www.sundancepower.com](http://www.sundancepower.com)  
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**HVAC:** Air Craftsman  
[www.aircraftsmanheating.com](http://www.aircraftsmanheating.com)  
**Energy Rater:** Vandemusser Design, [www.vandemusser.com](http://www.vandemusser.com)  
**Prefabricated building components:** Deltec Homes  
[www.deltechomes.com](http://www.deltechomes.com)

All of this eliminates our home’s contribution to mountaintop-removal coal mining. By honoring natural rhythms and using our roofs to cast a wide net for sunshine we eliminate the need for permanent and irrevocable destruction of our Appalachian forest through mountain-top-removal. Our home is one that literally and figuratively prepares our family for a bright future. Our pipes will never freeze and our home will always feel like a home should – stable and supportive of life (especially ours).

The power this gives us is immeasurable.

*Dan Clere is a North Carolina Licensed General Contractor (License Number 74292), a carpenter for JAG and Associates Inc., a Certified Interpretive Planner, and a graduate of Ball State University. He enjoys making esoteric concepts of building science understandable and relevant to laypeople. Many Ashevilleans know him as a former ground hog trainer and owl whisperer. He can be reached at [DanielClere@gmail.com](mailto:DanielClere@gmail.com).*



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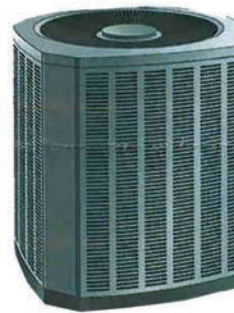
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# Tapping into the future

## Craft beer giant Sierra Nevada opens green facility in Mills River

▣ BY GARRET K. WOODWARD ▣

Cheri Chastain loves her job.

"It's really heartwarming and great to work for a company that has the same ethics and philosophy as I do, and is willing to put their money towards something that serves our environment, society and community better," she said.

Sustainability manager for Sierra Nevada Brewing Co., Chastain is at the forefront of the brewery's new \$100 million production facility in Mills River. With the official opening on Aug. 3, the facility is a modern testament to green building on not only a large scale, but also as a business entity.

"We're building it to LEED standards, which really encompasses everything you can do with a green building," she said. "Everything from making sure we have adequate bike and electric vehicle parking for guests and employees, to energy efficiency throughout the building, equipment selection, lighting control systems, structural design, sky lighting, water filtration systems, all the way down to materials and handling."

As one of the pioneers of the craft beer industry, Sierra Nevada has become a leader in their field and maker of some of the finest microbrews for the last 34 years. Based

out of Chico, Calif., the company hit 985,000 barrels for their 2013 production year. And with their expansion further into the East Coast, it was decided to build a facility in their emerging markets – an effort not only to increase barrel numbers, but also save time, money, flavor and energy consumption by products being shipped across the country.

"As far as a strategic business initiative, shipping beer is expensive and takes a lot of energy," said Sierra Nevada founder/owner Ken Grossman. "Both from the practicality of operating a single West Coast brewer and having a growing East Coast market, it didn't make

sense going into the future (with only the Chico facility)."

The Mills River facility is situated on a 180-acre property that borders the French Board River and the Asheville Regional Airport. Previously an unkempt forest, Sierra Nevada is underway with repairing the vegetation and native plants, ultimately transforming the site into a lush and vibrant landscape.

"It was full of invasive species and unhealthy trees, and we're going to manage it and create a healthy forest," Chastain said.

Of the 180 acres purchased, Sierra Nevada is going to develop around 20 to 30 acres into its pro-

Rainwater collection tanks at Sierra Nevada. (left) Ken Grossman, Sierra Nevada Brewing Co. founder/owner. Sierra Nevada Brewing Co. photos







Solar panels at the Sierra Nevada Brewing Co. facility in Mills River.

duction facility. Intricate preparations and designs were conceived to properly address and take advantage of the weather conditions of Western North Carolina, which is known for rainy seasons and hot, sunny summers.

"North Carolina gets a lot of rain, so managing our stormwater, and how it impacts the local environment, was a big thing for us," Chastain said. "We're recovering as much rainwater as possible. Everything that hits the pavement or the rooftop is recovered and used for flushing toilets and landscape irrigation needs."

And what about rainwater coming down on the other 150 acres of the property?

"The rest of the water will fall onto permeable surfaces, soak back into the ground, and prevent erosion," Chastain said. "If we get more rainwater than we can handle, we've also creating settling ponds to slow the flow of the water, and also stay onsite and not just erode back into the French Broad River."

When construction began, the brewery looked into using locally sourced or recycled materials. From the first step taken, the building was not created purely for aesthetics; rather it was designed for effi-

ciency and green initiatives.

"It takes a lot of time, money and detail," Chastain said. "You can't just pick something because it looks nice, you have to explore how much electricity it uses, how much water it uses, where did the materials come from, who manufactured the materials, so it does take a lot of time for a business to do this."

"North Carolina gets a lot of rain, so managing our stormwater, and how it impacts the local environment, was a big thing for us."

— Cheri Chastain, Sustainability manager for Sierra Nevada Brewing Co.

**Landscape Architect:**

Design Workshop, Asheville, design-workshop.com

**Building Architect:** Russell, Galloway Associates, Inc., Chico, Calif., rga-chico.com

**General Contractor:** Modern Building, Chico, Calif., modern-buildinginc.com

**Wastewater Treatment Plant/Microturbines:**

Symbiont, Milwaukee, Wis., symbiontonline.com

**Solar:** Sundance Power Systems, Asheville, sundancepower.com

They also took proper care of all the debris left over from the building project.

"We are recycling the debris from the construction," Chastain said. "Although you can source materials relatively cheap, it probably doesn't take into consideration the entire life cycle of the materials. Where did it come from? How was it harvested? How was it processed?

rich bio gas, with the energy cultivated from that pumping renewable electricity into two on-site 200 kW wind microturbines nearby.

"We all want to have a sustainable business and that means doing the same things we're doing generations from now, and being respectful of our resources," Chastain said.

Chastain encourages other businesses to look into sustainable green

How do we recycle it?" Sierra Nevada has diverted more than three million pounds of construction debris from local landfills through creative reuse and recycling efforts.

On the rooftop, Sierra Nevada covered the enormous space with a white membrane that prevents heats from being absorbed by the building. A large chunk of that rooftop space was also installed with 550 kW solar panels. A 50 kW panel was also installed in the parking lot as tree-like canopies.

Adding to that energy generated onsite, there is also an anaerobic digester that creates a methane-

initiatives for their own facilities. She notes that though the initial construction estimates may seem like a lot at first, the long-term savings, in terms of money and energy, far outweigh the startup costs.

"Too frequently people think they can't afford an expensive infrastructure, but there are so many things you can do that cost little or no money, like recycling, which can cost you nothing, and sometimes make you money," she said. "Look into things like changing your light bulbs to LED bulbs – don't get overwhelmed, remember that every small step adds up to a big change."



# Getting through winter on \$28

▣ BY GARRET K. WOODWARD ▣

James McGarvey shakes his head. "I cringe when I hear somebody is paying more than \$50 to \$100 a year to heat a newly built house in Western North Carolina," the 68-year-old said. "We have learned from building science that with a near perfect thermal/pressure envelope, homes can be heated much of the winter from internal heat gains such as lights, the fridge, electrical appliances such as computers and TV's, and body heat if built correctly."

Sitting on the back porch of his home in Candler, McGarvey and his wife Cilla relax into their seats, looking out onto their property. In the distance, the majestic peaks of the Blue Ridge Mountains loom, while the foreground is painted by lush vegetation and the sounds of a rooster corralling chickens.

"It's not rocket science to build a low cost energy efficient home — build it small and build a perfect building envelope, i.e. ,well insulated, air tight, and no thermal bridges," he stated, referring to his home.

Situated on a 7/10th-acre lot, the McGarvey's residence is an 830-square foot testament to effective modern green building. Constructed over the course of a year and a half by the owners, it's the ideal example of proper design applied to efficient technologies, and what the long-term benefits, both financial and environmental, can be. The McGarvey's built their home with their own labor and approximately \$38,000 in materials.

"By just doing a few simple things during construction, you can easily cut your building costs and your energy dependency," James said.

James notes that he had three factors in mind that influenced the design process of the house — cost, moisture control, and control of heat loss and heat gain. Function would trump form in all aspects of building process. Standing in the front yard, one immediately notices the home is built on poles. Pole construction for homes is not common except along the coastal areas of the U.S., but James points out that this method of construction



The McGarvey home, an 830-square foot green built structure in Candler. (above) James and Cilla McGarvey. (below) Garret K Woodward photos

helped them achieve all three of their goals: cost, moisture control, and energy efficiency.

"Pole construction kept our foundation costs under \$700, plus the walls in pole construction are not load bearing," James said. Therefore there is no need for headers over windows and doors, reducing lumber cost. Plus, as James points out, headers over doors and windows are huge thermal bridges

"By just doing a few simple things during construction, you can easily cut your building costs and your energy dependency."

— James McGarvey

reducing the overall R-Value of a buildings wall. So, pole construction allowed for a cost savings on the foundation as well as reducing thermal bridging so common in platform construction.

This type of construction also allowed us to move the house up seven feet in the air, thus getting space under the house for a carport as well as getting the house away from the moist ground and all the moisture issues associated with a basement or crawl space.

"This house is airtight," he said. "As far as I have researched, I've only come across a handful of other homes in the United States as tight

was achieved by putting an inner layer of OSB board on the inside of the house and taping and caulking all the seams. All plumbing and electrical work was then surface mounted so there would be no penetrations of the air barrier. "Our

as this one." The blower door reading put this house at .07 ACH@50Pa, a reading that puts the home in the top one tenth of a percent as far as air tightness goes. James points out that this tightness level







walls system also has two 2x4 staggered walls to achieve an R-45 wall system with no thermal bridging of solid wood inside to outside," he said.

"We gave cooling of the house a lot of thought," James said. "We have reflective roofing and siding, and large overhangs keeping the sun out off the windows, making for zero cooling cost. Open the doors and windows at night, close them during the day, and the house remains nice and cool."

Heading up the stairs and into the abode, one immediately notices the cathedral ceiling and optimization of space within. With 12-foot cathedral ceilings and only partial walls separating the living spaces, this house does not feel small. Also, James points out the use of a dark ceiling to add to the spacious feeling of the home.

James' extensive knowledge of energy efficiency isn't something he picked up overnight. Actually, he was an energy auditor himself, conducting thousands of home energy audits over the years. In the early 1970s, during the infancy stages of home energy efficiency, James entered the building science weatherization industry. Bouncing around the country for work, he eventually landed a position as an executive director of a multi-million dollar nonprofit weatherization science training center in Syracuse, N.Y. Since retiring James has taught the national BPI building science certification courses and has worked

with the Department of Energy to evaluate the DOE Weatherization Program in 11 Southeastern states.

While working for the Department of Energy evaluating energy programs around the Southeast, James and his wife came across Western North Carolina and fell in love with the region.

"We love the weather here, and the Blue Ridge Parkway," James said, referring to his passion for motorcycles.

"If there's anybody out there thinking about building something like this, I invite them to come and see what we're doing," James said. "Green building can be accomplished without spending a lot of funds on a building, so I encourage people to look into it."



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# Toward zero-landfill

## Lessons in construction waste reduction



In the center of the plant, we created a collection area with clearly labeled container for the unusual materials we hoped to collect in enough volume to recycle.

□ BY LEIGHA DICKENS □

It's ugly, but true: building something out of raw materials inevitably results in waste. According to the U.S. Green Building Council, a typical new home produces four pounds of waste per square foot of living space. Green building is about building energy efficient, healthy, and durable end products, but by definition it should also focus on using resources wisely, finding methods to reduce construction waste and reuse or recycle those materials.

As a manufacturing facility here in Asheville, we know this struggle well. We prefabricate panelized home packages – wall panels, floor and roof trusses – and ship them all over the country, with a focus on durable and energy efficient construction. We build green homes, but we also want to make our process as sustainable as we can. We are actively working toward the ambitious goal of zero-landfill production by 2016.

Zero-landfill is a challenging aspiration. We're well on our way, but we haven't reached that finish

line quite yet. The journey over the past few years to reduce waste and increase the amount of material we can divert from the landfill has been fascinating. We have gathered some resources and best practices along the way that can help other manufacturers and builders alike in their own quests to reduce construction waste.

### Lesson 1: A Central Cutting Area

Lumber is the most common waste material in a project built with wood, but fortunately it is also an easy material to divert from the landfill. The GreenBuilt North Carolina green certification program offers credits for reducing construction waste, and one of the recommended strategies is to create a central lumber cutting and storage area on a jobsite. This creates opportunities to find a preexisting piece for a specific need rather than cutting a new one.

As a manufacturing facility our process naturally dictates a central cutting area, with computerized

saws to help us use our raw materials optimally. Yet by cutting and keeping all of our scrap material in one place, we discovered an easy supply of nine-inch long 2x6 blocks, key components of our floor trusses. Now our saw looks for opportunities to cut any excess lumber from a project into nine-inch lengths, greatly reducing the amount of waste material.

Even if you're not a manufacturer with a fancy saw, keeping your scrap in one place allows you to exploit your lumber supply to its fullest. And once your project is done, dimensional lumber doesn't have to be landfilled: as long as it is not pressure treated, you can

take all of scrap you saved to the local stump dump to be mulched or turned into boiler fuel.

### Lesson 2: Create Opportunities by Collecting and Sorting

Good jobsite waste management means creating a central location to collect the most common materials produced. I've been to too many jobsites that didn't even have a regular blue recycling bin! The power of jobsite collecting and sorting goes much deeper than the odd plastic bottle or soda can: it offers education on just how

#### Local Construction Waste Resources

- The Riverside Stump Dump can take assorted dimensional lumber scrap (non-pressure treated.) [www.riversidestumpdump.com](http://www.riversidestumpdump.com).
- Habitat for Humanity will often accept building material donations for their housing projects and their Re-Store. [www.ashevillehabitat.org](http://www.ashevillehabitat.org).
- Curbie, Inc handles municipal recycling for the City of Asheville, but they also have a commercial collection program. [www.curbie.com](http://www.curbie.com).
- Waste Reduction Partners is a program of the Land of Sky regional council. They offer audits, consulting, and are a resource for finding other companies also trying to recycle a similar product. [www.wastereductionpartners.org](http://www.wastereductionpartners.org).



much of each material your process is creating – the results may surprise you. Collecting and sorting can also offer interesting re-use opportunities all on its own, and of course, if you collect enough volume of a material, there's a chance you can find a recycling market for it.

Create a collection point on your jobsite with easily accessible and clearly labeled containers. Implement a "culture of sorting" by emphasizing that extra step of bringing a material to its designated container. Make it fun: have friendly competitions, reward successful reductions in dumpster volume from job to job.

We realized several benefits of collecting and sorting a few years ago when we began collecting scrap house wrap, plastic wrapping and plastic pallet strapping. These materials were periodically picked up by a company that takes various types of recyclables to be baled and sold on large-scale markets. The program went along well until trouble struck last year, when our recycling company reluctantly announced that it could no longer find a viable market for all of the materials they had been taking.

Ongoing research continues to look for new markets, in the meantime we have decided to continue collecting and sorting these materials anyway, as we've found we're able to re-use some of the plastic wrapping and plastic strapping in our own processes. Having those materials on hand in collection boxes – rather than buried in a dumpster – makes reuse possible, and keeping the momentum of the culture of sorting that we've developed has benefitted us in other ways. When a new opportunity to recycle our scrap vinyl siding came along late last year, we were able to im-



(left) A typical new construction can produce four pounds of waste per square foot. Green building aims both to reduce how much waste is produced and to divert excess material from the landfill. (right) We devised a method of insulating our headers by filling them with chipped up scraps of leftover polystyrene insulation board. Leigha Dickens photos



plement with ease because we had already accustomed ourselves to collection.

### Lesson 3: Team Up With Others

Sometimes volume is a key variable in determining if recycling a material is cost-effective. Teaming up with others who also produce a similar scrap material can improve that cost-benefit analysis. In my previous story, though our recycler stopped taking some of the materials we had been giving them; we did find a growing community of other local facilities who were also interested in recycling plastic strapping. All of us, together, create enough volume to keep plastic strapping worth their while to collect.

Teaming up with a charity can

also offer opportunities. We have worked with local charities such as Habitat for Humanity, as well as international charities such as World Mission, to donate scrap plywood, foam board insulation and sizeable pieces of fiber cement siding.

### Lesson 4: Flexibility and Creativity

If many of the strategies in this article are simple common sense, we've also had to be creative and willing to embark on projects just to see how they would turn out. After donating our larger scrap polystyrene, we were left with small pieces not easily usable by someone else in construction. We chip up those small pieces into even smaller pieces and use those to fill our header boxes – simultaneously

re-using a waste material and providing insulation to a key location. This year we're trying some new projects indeed, such as working with Wild South to save small and odd-shaped plywood scraps for a squirrel box building night.

Institutionalized solutions, one-off projects, collaborations with other companies and adaptation when markets change – it has taken all of those approaches to get us where we are today, an 80 percent landfill diversion rate.

*Leigha Dickens is the Green Building Coordinator for Deltec Homes, an Asheville company that panelizes hurricane-resistant, energy-efficient and net-zero homes. She is a RESNET HERS Rater and studied physics at UNCA. Others interested in teaming up for recycling opportunities should contact her at [ldickens@deltechomes.com](mailto:ldickens@deltechomes.com)*

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# Designing communities

Where people love to live

▣ BY DENA CHANDLER ▣

I grew up in a neighborhood that was a built upon converted corn-fields. Each lot was one-half acre and fenced. We rarely socialized with our neighbors. It's not that we didn't want to get to know each other, but each family spent time outside in their respective backyards and brief encounters were more often in the form of a wave as one drove through the neighborhood.

This seems to be a common theme of planned developments that I've encountered because neighborhoods and developments are typically designed to achieve a certain number of lots, or units, and ultimately to meet a financial goal. This full-yield design approach doesn't offer much in terms of overall visual character or living experience.

Developments of this type are planned as static places, not as dynamic communities of people who will be living there once construction is complete. This is unfortunate because the design strongly shapes the community itself. During community planning, it's the attention paid to these features, from the uniqueness of the site to the usability for its residents once built that really make a community where people want and love to live.

One of the most important first steps in the design of a development is identifying the resources

of a site, both natural and cultural. Planners, landscape architects, and other design professionals involved in a project must take the time to understand the opportunities and challenges of the land offers. Natural traits unique to a property, like streams, wetlands, and plant communities, are valuable components to incorporate into the design. It's much easier to wipe the slate clean and start from scratch. This is not a good method. An up-front attempt to better understand the context of the site is an important, but often overlooked, foundation of design. The following is a list of common design criteria that help to create a community where people love to live.

**Walkability** – A community's internal network of sidewalks and trails, as well as external pedestrian connectivity, determines the walkability of a community. A walking friendly community, whether in an urban or suburban setting, is one where people can set out on foot to restaurants, shopping, parks, and other nearby amenities. A home-buyer survey conducted by the National Association of Realtors and National Association of Home Builders selected trails as the second (out of 18) most desired community amenity by home buyers (2002). This is why so many people live near a downtown – direct access to goods and services.



A low impact development and infill project, Davenport Park is located in west Asheville. Equinox Environmental photos

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"Let people work where they live" is a legacy that urban planner and author of *The Death and Life of Great American Cities*, Jane Jacobs, spent her adult life trying to instill in urban planning efforts. This development pattern not only encourages a lively street atmosphere that Jacobs admired, but it's also efficient, family-friendly, and concentrated, allowing people to walk to work and return home for lunch, or take a bus to their job just a mile or two away. I can trace several of my friendships and noteworthy experiences in Asheville to taking city transit, walking, and riding my bike to work. With walkability comes the increased opportunity for community interaction, which is essential to the foundation and the very definition of community.

**Community Spaces** – This can be as simple and as informal as a community garden or as complex as a public, urban courtyard. Gathering spaces can benefit the community in multiple ways whether it fosters community within diverse groups of people or with like-minded individuals. In a West Asheville low-impact development, Davenport Park, people interested in green living find that simple functional elements, like shared driveways, have resulted in valuable informal community spaces.

Resident Jim Grode stated that "one of the things we really love about our development is that the front porches, lack of garages, and proximity of houses create opportunities to interact with our neighbors."

The sense of community in this development is very strong and can be attributed to taking the emphasis off the vehicle and placing



it instead on people. Residents Chris and Jessica Larsen claimed that the "neighborhood feel truly brings the community together for social activities" as well as community spaces that "focus on edible landscaping."

Designing to provide opportunities for social interaction when desired and privacy when not desired can help foster a sense of community as occurs in Davenport Park. In an urban community setting such as that found in the downtown Asheville Kress Building, which houses both owned and rented condominiums, people of many backgrounds are living together. Resident Dorothy Foltz-Gray values her friends within the community, "all of whom are so different, and yet who accept difference." Community interactions occur in small functional spaces such as the elevator, the stairwell, and at a rooftop gathering space fondly nicknamed the "living room."

In a rural setting, the principles are the same, but the community

spaces can be larger and more adaptable. For instance, Sugar Hollow Orchard in Fairview has a community-shared agricultural space. Resident William Hamilton explains, "the common land increases the value of the home-sites and greatly increases the quality of life for its residents by the simply providing a lot of open space."

**Green Space** – In rural and suburban settings, preserving open space is important – a lake, a stream, a stand of hardwood forest, or a grove of trees – all become key features of a development. An example is the apple tree grove for which Sugar Hollow Orchard was named. Even in urban settings, it's vital to integrate open space in some form into the design. A connection to green space, no matter how small, is essential to foster a healthy community – people need to decompress and reconnect – and sharing that with others within the community can be a valuable way to build and strengthen relationships.

### Sustainable Design Features –


More and more people are looking for developments that incorporate "green building" and sustainable landscape features. The general public has even become somewhat savvy or at least aware of these changes. Stormwater design, sustainable building materials, and site design that all focus on efficiency and low impact are beneficial to the overall community, as well as individuals (i.e. lower utility bills).

Julie Mayfield, a Davenport Park resident, enjoys how natural stormwater treatment alternatives like raingardens are used rather than traditional structures, such as curb and gutters and storm drains that flow directly to streams. "It looks much nicer and is better from a water quality perspective." The aesthetic of a place is important and helps shape how you perceive and feel in a place, and if it's driven by ethic, it's even more powerful.

**Architecture** – Mention of these features must be done within the context of the key role they play in the overall feeling of a development. It's irrefutable that the architecture, including the style, character, materials, and colors of the homes are all important elements that play a large role within the landscape. However, even a neighborhood filled with high-end homes can go to shambles quickly if the residents lack a strong sense of community. If people love their community, they are more likely to watch over it, care for it, and nurture it in the long run.

*Dena Chandler is an Environmental Designer at Equinox Environmental in Asheville. Dena's work experience as an Environmental Designer includes sustainable landscape design and low impact development on projects including Davenport Park.*

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# Good news, bad news and the Living Building Challenge

□ BY STEVE FARRELL &  
EMILY COLEMAN-WOLF □

"Imagine a world that is ecologically sustainable, culturally rich, socially just and beautiful"

This is the vision of the Living Building Challenge founder Jason McLennan.

Folks familiar with the evolving environmental movement will no doubt agree that there is an overwhelming sum of bad news. The green building movement, including our heroes working with the WNCGBC, have worked tirelessly to make things much "less bad," an essential step on this path that gives us hope.

Still, there is some bad news. Twenty plus years of LEED Buildings and the unmistakable take away (as discerned by the folks at the Living Building Challenge) is, "It's not nearly enough." Carbon emissions continue to climb to dangerous levels and the entire world seems hell-bent on following the carbon intensive lead of the US.

On the flip side, 20 years of LEED Buildings have demonstrated that it is possible to effect positive change through the marketplace.

But the bad news is that in order to financially encourage change, the true cost to society of pollution, carbon emissions, loss of habitat, loss of topsoil, etc. needs to be given a dollar value rather than written off as "externalities." Until this happens we are "rearranging deck chairs on the Titanic."

Good news. Technology may soon advance enough to begin to mitigate the damage done by, well, technology. It's a stretch to imagine that the means that got us in trouble will get us out of trouble, but we don't have any other options. While we can slow the pace by doing our green building and local living best, it's hard to imagine the exploding population freely passing on the comforts of modern living. Even deep dark greenies need safe, comfortable shelter.

The continued good news is we have all the pieces of a sustainable

future at our disposal. We know what we have to do and we know how to do it. We also know from experience that if the leadership exists the rest is possible and even likely. The U.S. used to lead the world in innovation and we can (in fact, we must) be the world's leaders in clean energy, water conservation, sustainable materials harvesting, and social justice.

The Living Building Challenge (LBC) may or may not be the vehicle that takes us to this place. There is no doubt, however, that the vision presented is essential to a collective, viable culture.

So what exactly is The Living Building Challenge? Its mission is to encourage the creation of Living Buildings, Landscapes and Neighborhoods around the world while inspiring, educating and motivating a global audience about the need for fundamental and transformative change.

The Cascadia Region Green Building Council (CRGBC) – the Pacific Northwest chapter of the USGBC – defines a living building as a structure that "generates all of its own energy with renewable non-toxic resources, captures and treats all of its water, and operates efficiently and for maximum beauty."

The LBC is comprised of seven performance areas, or "Petals": Place, Water, Energy, Health and Happiness, Materials, Equity, and Beauty. Petals are subdivided into a total of 20 Imperatives, each of which focuses on a specific sphere of influence. For example, one Imperative under the Materials petal is that no materials containing chemicals from the Red List be used. Some of these chemicals are easy such as lead, asbestos, and formaldehyde. Some of them such as phthalates and polyvinyl chloride (PVC) are very challenging. They are in everything from light fixtures to plumbing fixtures. PVC is not dangerous for the occupants of the building, but the manufacture of it is very harmful for people and the environment.

There are also three Typologies:

Emily Coleman-Wolf photos



Buildings, Renovations, and Landscape and Infrastructure. Project teams must identify the typology that aligns with the project to determine which Imperatives apply. Each project must also identify its Living Transect, or intensity of development surrounding its site. There are six Living Transects, ranging from Natural Habitat Preserve to Urban Core.

In order to achieve full certification, all Imperatives assigned to the identified Typology must be met. And the project must be operational for 12 consecutive months. This will insure the certification is based on the actual performance of the building.

Did you get all that? Yeah, neither did we the first time.

Here's a simplified outline to help you understand.





**1.** Pick a project type: buildings, renovations, or landscape and infrastructure.

**2.** Identify the Living Transect or site density:

- L1. Natural Habitat Preserve (Greenfield sites)
- L2. Rural Agriculture Zone
- L3. Village or Campus Zone
- L4. General Urban Zone
- L5. Urban Center Zone
- L6. Urban Core Zone

**3.** Look at the chart to see which Imperatives must be met for each of the seven Petals: Place, Water, Energy, Health & Happiness, Materials, Equity and Beauty.

**4.** Meet all the required Imperatives  
**5.** Complete the project and then wait a year to be sure the building performs up to the design.

It is not easy, but if each new project achieved even one of the LBC Petals, the effects would be astounding.

Think about it: buildings that produce as much energy as they use (Net-Zero Energy), that reuse all their water (Net-Zero Water), that feel good to be in with natural light and vegetation (Health & Happiness), and are built with non-toxic

materials (Materials).

A project can achieve Petal Recognition, or partial program certification, for achieving all of the requirements of at least three Petals when at least one of the following is included: Water, Energy, and/or Materials. A project can also achieve Net-Zero Energy Building certification.

Currently five projects have achieved Living Certification by meeting all Imperatives of the Living Building Challenge, 12 projects have achieved either Petal Recognition, Net-Zero Energy Building certification, or both.

Let's be honest: the Living Building Challenge is very, very hard to achieve. It's no coincidence that the title of the program includes the word "Challenge." It's helpful to remember that LEED was very hard when we first started and now it's standard practice.

We can do this. We must do this. Let's commit to "Evolve Faster."

For more information on the Living Building Challenge visit the website at [www.living-future.org/lbc](http://www.living-future.org/lbc) and be sure to like the Living Building Challenge Collaborative Asheville Facebook page.



*Emily Coleman-Wolf, LEED AP AIA, is a project architect at Padgett & Freeman Architects. She is passionate about green building and served on the WNCGBC Board of Directors from 2006 to 2010. She is now an ambassador for the Living Building Challenge and is helping establish the Asheville Collaborative*

*Steve Farrell is chief cook and bottle washer at Stephens Smith Farrell Architecture in Asheville. He is Architect of Record for the first LEED Certified Building in Western North Carolina and sits on the Western North Carolina Green Building Council Board of Directors. He is an ambassador for the Living Building Challenge and is a member of the Asheville Living Building Challenge Collaborative. He lives and gardens in a net zero energy home in the Kenilworth neighborhood of Asheville, NC. Website: [www.AshevilleArchitect.com](http://www.AshevilleArchitect.com).*

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John McDermott photos

# Design elements of a net-zero home

▣ BY JOHN McDERMOTT ▣

Building a green or sustainable home is becoming a common practice in Western North Carolina. Taking the home to the level of net-zero energy is now within reach for many green building projects. Having a net-zero energy (NZE) home means that the total amount of energy used per year is roughly equal to the amount of renewable energy (RE) created on site. This RE can be generated by wind, solar, geothermal and/or hydro systems. In our region, passive solar, photovoltaic and solar thermal panels are the most popular choices due to excellent solar availability and affordability. Thus, solar energy as a basis for creating a NZE home will be the focus of this article.

The Intergovernmental Panel on

Climate Change notes in its latest assessment that "... many RE technologies have demonstrated substantial performance improvements and cost reductions in the past ten years." For example, since 2008, the price of solar panels has fallen more than 75 percent, while performance has improved significantly. With net metering capability from local utility companies, solar electric production no longer has to be stored in expensive batteries. Further savings can be achieved by pooling buying power through programs such as the successful "Solarize Asheville Campaign."

Combining these advancements in technology and local competitive pricing with generous tax credits from federal and state governments (up to 65 percent of installation costs) makes net zero building very

attractive. Here we will offer creative ideas for energy conservation through mechanical components, building design, and human behavior.

## Conservation through mechanical components

We know a few things about energy: it is mainly produced from fossil fuels, it is expensive, and its cost will continue to rise in the future. Focus attention when homebuilding on major energy consuming components such as heating, cooling, and hot water, which can constitute up to 60 percent of a home's utility bill. The following can help conserve precious resources.

**Heating and cooling:** A geothermal heat pump can heat, cool,

and, if equipped with an optional desuperheater, can supply the house with extra hot water. The system utilizes the constant temperature of the earth as the heat exchange medium instead of the outside air temperature. This allows the system to reach remarkably high efficiencies of 300 to 600 percent. Relative to air-sourced heat pumps, geothermal systems are quieter, have over twice the life expectancy, need little maintenance, and do not depend on the temperature of the outside air. Combining the generous state and federal tax credits along with the energy savings, the return on investment for new construction is just a few years. All HVAC ductwork should be designed to be within the insulated envelope or conditioned space of the house. This will





eliminate energy losses due to heat transfer and air leakage from the ductwork to the outside.

**Water heating:** For maximum energy savings, combine a heat pump water heater with the desuperheater option on the geothermal heat pump, or utilize solar thermal panels. The hot water tank needs to be centrally placed to bathrooms and kitchen to minimize hot water runs (thermally insulate), or a well insulated half-loop water recirculation system should be considered.

**Lighting:** CFL (compact fluorescent lighting) and LED (light emitting diode) lighting use 75 to 90 percent less energy than standard incandescent and halogen bulbs. Currently, local utility companies offer attractive subsidies on energy efficient bulbs, making this choice super affordable.

### Energy conservation through human behavior

Be conscious of your electric use and save up to 25 percent of total energy use in your home. Here are a few common sense pointers:

- Use water saving plumbing fixtures and limit shower time.
- Lower the hot water tank temperature to 120° F or less.
- Turn off lights when leaving the room and use dimmers where possible.
- Use energy efficient front loading washing machines that utilize very high spin cycles to lower moisture levels in clothes, then air dry your washed clothes whenever possible.
- Maintain an indoor air temperature of 58 to 68 F in the winter heating periods and 75 to 79 F during the cooling months. Keep your relative humidity less than 60 percent to avoid growing indoor mold and musty odors.
- Reduce your indoor cooking during the summer air conditioning season – try more outdoor grilling.

**Ventilation:** Energy-efficient, air-tight homes require mechanical ventilation to maintain indoor air quality. There are many different ventilation systems to consider, but the most energy efficient is ERV (energy recovery ventilation).

ERV is both an energy recovery and a humidity balancing process when exchanging indoor and outdoor air. Most ERV systems can recover about 70 to 80 percent of the energy of the indoor air and deliver that energy to the in-

coming air. ERV vents could replace bathroom venting systems and possibly kitchen venting systems, further reducing exterior wall penetrations and offsetting the cost of the ERV.

**Appliances:** Simply choose energy star-rated appliances that are listed on the government sponsored website: [www.energystar.gov](http://www.energystar.gov).

### Energy conservation through building design

**Windows:** The strategic placement of windows is crucial in a passive solar house. Design for an overall window to floor ratio of about 18 percent, with 12 to 14 percent on the south side. Minimize the window area of east, west, and particularly the north side of the house. South-facing windows

continues on, page 38



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continued from, page 37

should have a Solar Heat Gain Coefficient (SHGC) of 0.5 or greater, in conjunction with appropriate overhangs, to allow for passive solar heat gain in the winter months and shading in the summer months. The remainder of the glass should be a low E 366 double or triple pane filled with argon/exotic gas with a U-value of .15 to .28.

**Thermal mass:** For successful passive solar design, interior thermal mass is a critical element to maintain steady indoor temperatures by storing the solar energy to later be released during cold winter evenings. A popular, low maintenance, and economical choice is concrete floors with a thickness of three to four inches. Other high density thermal mass materials could be natural stone, steel (I-beams), or thick granite countertops.

**Super insulated structure:** Strive for at least 40 percent higher R-values than the local building code requires. For example, use a rigid foam of > R10 on the exterior walls, over 2x6 studs that are filled with fiberglass batt or cellulose insulation. This wall profile will greatly reduce any thermal bridging. Use a rigid foam such as polyisocyanurate or spray foam in the roof areas, soffits, and band board.

**Air tight envelope:** Use a continuous air barrier with all the cracks, holes, and exterior envelope penetrations systematically sealed or caulked. Blower door test results should be less than 1.5 air exchanges/hour @ 50 pascals (inside/outside pressure differential).

**HERS Index:** Home Energy Rating System (HERS) index is the building industry standard for measuring a home's energy efficiency. Hire a certified Energy Rater early in your project to assess your home's energy performance. ANZE home would have a score of 0. Currently, the local utility company has attractive rebates up to \$4,000 based on the home's HERS score.

### Energy production

Now that we have reduced our energy demand to a minimum, we must generate an equal amount of energy in order to balance to net-zero.

**Passive solar:** If your home site has a southern orientation, utilizing a passive solar design has many

benefits. It is economical to install: follow the North Carolina design guidelines and receive a 35 percent tax credit for associated costs. A good passive solar design can reduce winter heating requirements by 50 percent, and it provides an abundance of natural light, reducing lighting costs. There are no moving parts and it therefore requires little maintenance. Finally, a passive solar design has an aesthetic appeal, as it brings nature into your home through the materials used and ample views of the outdoors.

**Active solar:** We all like the convenience and comfort of electricity for lighting, appliances, and electronics. In our NZE house, we will need to generate this electricity. Photovoltaic solar panels are economical to install and new designs are increasingly efficient. Solar thermal panels can heat water for domestic purposes, and excess energy could be used to heat the home.

**Woodstove and wood burning techniques:** Most environmentalists cringe at the concept of burning wood, but in Western North Carolina, with abundant wood resources such as dead rotting trees producing CO2, wood is a viable means of generating supplemental heat for the home. The trick is to burn clean! Start with firewood that is split into small pieces, seasoned outside for more than two years under cover, and use a newer, high efficiency European wood stove (with more than 75 percent efficiency). With these techniques, one rarely has smoke (or particulates) billowing out of the chimney. And it certainly beats coal-fired electricity in terms of efficiency and pollutants.

**Final thoughts:** National governments have made limited progress in reducing greenhouse gas emissions. Recently, the EPA proposed a 30 percent reduction in carbon polluting emissions from electrical power plants by the year 2030. Our planet can not wait any longer for action in fighting global warming. We as individuals can make real progress now by taking personal responsibility and reducing the energy use in our homes.

*John McDermott founded Green Acres in 2010, a net zero energy eco-community in southeast Asheville. His vision is a sustainable community with organic gardens, orchards, and energy efficient contemporary homes. Perhaps best known locally as co-founder of Highland Brewery, the first Asheville microbrewery, John also created Bola Design to showcase his contemporary furniture and home accessories.*



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# Hybrid vigor

Planting solar panels on green roofs produces mutual advantages



Green Roof at the Dr. Wesley Grant Rec. Center, Asheville. Living Roofs, Inc. photo

▣ BY EMILIO ANCAYA ▣

**T**here are two facts of nature that we can always count on – the sun shines and plants grow in a living partnership.

This synergistic truth now goes even a step further when solar energy is gathered via solar photovoltaic panels embedded amid the plants comprising a green roof. It is, in a unique way, a modified form of photosynthesis.

Solar panels are no longer unusual sights in either urban or rural landscapes, ranging from literally acres of panels in a solar farm to a single unit on the roof of a home. However, green roofs still are not widely known or understood by many people, though the awareness is growing. In general terms, a green or living roof is a vegetated covering for a roof, with soil and plants taking the place of metal, gravel ballast, asphalt, shingles or tiles. It's not a new technology since sod and other living materials have topped human

dwellings for centuries.

But the growing demand for environmentally sound, sustainable solutions is increasingly leading to utilization of green roofs by architects, engineers, landscape architects and roofing contractors. This demand has increased the use of green roofs on commercial, institutional and residential projects through both new construction and retrofits.

In its simplest form, a living roof usually consists of an initial layer of waterproof membrane on which additional layers are built up. The final and visible element is a soil base covered by carefully selected species, textures and colors of plants that provide more than simple aesthetics. A properly designed and installed green roof delivers a wide and diverse range of benefits, including reductions in energy costs, improved stormwater management, enhanced air quality and better longevity of roof materials.

And now it's been determined these same benefits significantly enhance the performance and efficiency of solar panels planted on a green roof. According to several recent studies, strategic placement of photovoltaic (PV) panels in a "solar garden" has proven both to improve energy gathering and the wellbeing of the plants on the green roof. In essence, this integration establishes a microclimate that is mutually beneficial, and enriches and expands the advantages offered by both.

Research conducted at the Bronx Design and Construction Academy in New York City indicated an efficiency boost of about three percent, while ongoing research in Berlin shows that solar panels on a green roof average a six percent higher output than those on a standard roof. Other research has produced increases in performance of up to 16 percent. Key elements having an impact on the boost are the

size of the roof, how panels are positioned, climate and the types of vegetation utilized.

The critical underlying issue is that solar panels get hot. A major impact on PV output is the extreme heat on rooftops that both affects energy capture and presents maintenance issues. It's the cooling aspects provided by an accompanying green roof that produce significant performance gains in PV panel performance. The plants serve as insulation and "air conditioning" for the heat-sensitive PV elements, such as microinverters, since a green roof typically is up to 30 degrees cooler than a conventional roof. The cooling effect increases energy-gathering efficiency, while reducing or eliminating the need for complex mechanical systems to remove heat. The green roof also decreases the amount of airborne pollutants and dust that can be harmful to PV panels and their systems, reducing mainte-





Green roof with solar panels, Pittsburgh, PA. Xero Flor America photo

for long periods of time. The presence of shaded areas also allows the use of more shade-tolerant species that broaden diversity and improve a green roof's overall importance as an eco-friendly solution that helps increase the energy performance of a building since it reduces unwanted heat gains in the summer and heat losses in winter. The materials that form the infrastructure for a roof garden act as insulation for the building, often producing energy savings of up to 30 percent.

Capitalizing on these mutual benefits is gaining ground as innovative design and manufacturing approaches focus on strategic positioning of PV panels and plant cover to boost performance and maintain the health of the green roof. It is important to note that a successful and productive "solar garden" requires the involvement and interaction of experienced, knowledgeable professionals with the combined expertise to install a sustainable green roof, and properly array and operate the PV panels.

But the proven fact is that every percentage point of improvement in the performance of solar photovoltaic panels has a positive impact on the acceptance, accessibility and utilization of this valuable form of alternative energy capture and production. Increasing the partnership between solar energy and green roofs appears destined to generate positive results that will produce environmental, economic and aesthetic value.

*Emilio Ancaya, GRP, is co-founder of Living Roofs, Inc., a green roof design/build and maintenance company based in Asheville. [www.livingroofsinc.com](http://www.livingroofsinc.com).*

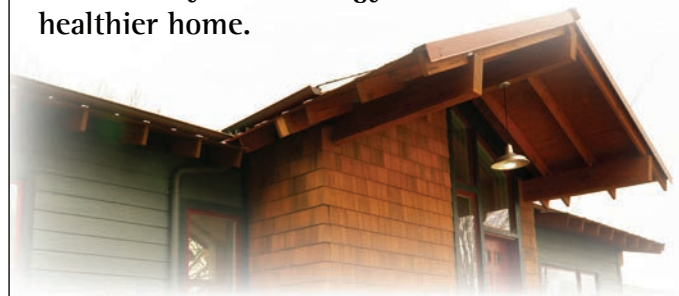
nance requirements and costs while having a positive impact on system longevity.

It's also worth noting that placing PV panels on a roof effectively eliminates issues that hamper at-grade locations. Typically, such sites must be permitted, and grading is usually needed for proper stormwater control and to reduce erosion. Frequent maintenance is necessary, and perimeter fencing often is required. However, installing solar arrays on a commercial flat roof eliminates the need for fencing and drainage is effectively handled by the underlying green roof. Virtually any size or scale of solar green roof dramatically decreases a building's impact on the environment and saves valuable green space at ground-level.

One unexpected finding of the recent studies was that the green roof's plants also profit from the presence of PV panels. The shade created by the panels lessens the sun's direct impact on the plants, even those selected especially for their ability to withstand full sun

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# The easy part of green

Locally grown native plants in your landscape

Warren Wilson College. Samsel Architects photo

▣ BY BILL JONES ▣

Every new home, commercial and residential development – or for that matter any new construction project – requires a building permit. They also require a landscaping plan.

In reviewing The Sustainable Sites Initiative developed by the A.S.L.A., The Lady Bird Johnson Wildflower Center and the United States Botanical Garden, planting and preserving native plants can and will pay in many ways. The U.S. Green Building Council is a major stakeholder and has committed to

incorporating these guidelines and standards into the LEED Green Building Rating Systems. Even if you are not looking towards LEED Standards, locally grown native plants are more “green” than exotics that “are not from around here.”

So, how do native plants fit into sustainability, green building, and these developing standards and guidelines?

By first understanding why using native plants in landscaping is an environmentally and economically sound practice, it's then easy to see how they readily fit into sus-

tainable and green building concepts and implementation. A landscape plan that embraces native plant material has many advantages before the discussion of standards and initiatives comes into play.

There are four major points to remember, and we often refer to these as selling points in a landscaping presentation:

■ Native plants are environmentally friendly. They require less maintenance and are cost effective in the landscape. In other words, they require little to no pesticides and fer-

tilizer treatments and will not require irrigation for their survival. This can be a very substantial cost savings for your clients in the long run. It can be especially important for clients who have vacation homes.

■ Native plants are hardy. They have adapted and evolved through the ages to local soil types and climate therefore withstanding winter cold and dieback as well as drought conditions. Consequently, they have a better survival rate.

■ Native plants promote biodiversity, provide food and shelter for native wildlife, and restores regional



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landscapes. It is vitally important for birds. Most birds species feed their young insects, insects only thrive on native plants. The removal of native plants from the landscape can be seen as a major cause of reduced bird numbers and diversity. A native landscape can blend effortlessly with the surrounding natural landscape.

■ Native plants prevent future exotic and invasive plant introductions. Although many exotic, or non-native, plants are not invasive, some are. Invasive exotic plant material escapes, naturalizes, spreads, and replaces the native plant communities. These exotics can be vectors of disease and insects. Kudzu, privet, and oriental bittersweet are examples of exotics gone awry in the mountains of Western North Carolina.

The other aspect mentioned is buying locally grown plant material. Horticulture studies prove that plants raised from local stock (progeny) in the same climatic conditions where they are planted will undoubtedly survive better.

#### So, how does locally grown fit into this?

There are some distinct advantages of buying plant material from your local growers. In buying from local nurserymen, plant survivability is enhanced, you are supporting local families and businesses, and helping to save energy and prevent pollution. The Asheville Chamber of Commerce reported that an extra 35 cents of every dollar spent on locally sourced products (not just plants) stays local. Plus, who is best to answer your questions about plants than the growers themselves?

#### And how does buying locally grown plants increase their ability to survive?

Common sense tells us that a plant grown in the same climatic conditions such as rainfall, winter and summer temperatures, and elevation as the locale in which it will be planted will survive better. Do you really think a plant grown in Alabama, Florida or Eastern North Carolina with little (or no) winter will do better in Western North Carolina? That doesn't even consider the plants progeny, in other words where did the seed or original cuttings come from. It certainly makes sense, especially when the plants you sell or install need to have every advantage you can give them to survive, to buy local material when possible.

We all can agree that buying local produce from the farmers market help insure a strong community, preserves family farmland, and prevents urban sprawl. Nurseries are the same. As the first environmentalists, farmers and nurserymen depend on the vitality of their land to insure their future.

#### How does buying local save energy?

Well, in the shipping of course. What is the energy cost of shipping plants from Oregon, Florida or Eastern North Carolina? And with the



Derek Olson photo

prospect of global warming, what about the carbon input into the atmosphere. Buying local plants may decrease overall fuel demand and lower your fuel costs.

#### The bottom line – straight from the nursery and into the ground is the best bet.

"What does sustainability mean to you?" That was the question posed to me once by Alison Arnold, former Director of Horticulture at the N.C. Arboretum. At that time, I hadn't thought about it and certainly had no quick answer. Now I say that sustainability, as far as landscaping is concerned, means a landscape of native plants that naturally enhances and fits its surrounding ecosystem. Like an old cabin in the woods, a man put it there, but it certainly seems like it belongs.

*Bill Jones is founder and president of Carolina Native Nursery located in Burnsville. Carolina Native grows over 100 species of native shrubs and provides consulting as well as native landscape design and installation services. For more information, click on [www.carolinanativenursery.com](http://www.carolinanativenursery.com) or [info@carolinanativenursery.com](mailto:info@carolinanativenursery.com).*

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# Buyers wanted: certified green homes

□ MARY LOVE □

Asheville has been a leader in the green building movement for the past decade.

During the "boom" period, certified green homes announced their arrival with amazing speed and were soon the golden child of new home construction. During the recession, certified green homes sold quicker than standard code build homes. This trend was similar throughout the nation in cities that promoted green building.

As the housing market starts to grow again, green building is becoming an important factor nationwide. A McGraw Hill 2014 report, Green Multifamily and Single Family Homes, states, "The market share of green building is expected to grow 26 to 33 percent by 2016." Certified green building programs, such as Green Built NC, have been in the housing market long enough now to show increased value. Consumers are demanding energy efficiency and good indoor air quality. As more information about green building becomes available online, consumers are valuing third party certifications and Green Multifamily and Single Family Homes, states they are willing to pay up to three percent more new construction.

Certified green homes are still a fraction of the total Buncombe County market, however, it accounts for

about half of the new home construction underway inside the city limits. West Asheville currently has the highest demand and many of the new homes are sold before completion. Locally, as well as nationally, as consumers start to demand green building, more builders are willing to make the shift due to code changes and increasing affordable and availability of green products.

Another important green building trend deals with existing homes. During the housing recession, many homeowners decided to remodel instead of sell. Those homes are now going on the market and more consumers are concerned about energy efficiency as well as cosmetic improvements. Green Multifamily and Single Family Homes, reports that consumers are willing to pay up to five percent more for green improvements on existing home as long as those improvements can be verified.

Once again, Asheville and the Western North Carolina Green Building Council (WNCGBC) are leading the way by creating the Green Gauge Program. The program allows existing homeowners to use a standardized evaluation to determine how "green" a home is currently and how "green" it can become with certain improvements.

WNCGBC oversees the program and trains certified auditors to ensure professional third party ratings.

Green Gauge participants can receive an Energy Performance Score (EPS). EPS is an energy auditing system similar to the miles-per-gal-

qualified contractors, incentives and potential financing opportunities. This assessment will help Realtors, buyers and sellers know about var-



Beach Builders photo

lon rating for the auto industry. EPS provides an estimate of actual home-energy consumption based on a detailed analysis of the home as well as related carbon emissions. It shows homeowners where they rank in comparison to state average.

The Green Gauge Report provides valuable information and suggestions about how to green the home along with easy access to

ious green features that are often difficult to quantify. The Green Gauge Program will provide valuable documentation to support increased value of green remodeling.

Mary Love is the team leader for Love The Green Team and Director of the Green Division for Keller Williams Realty Asheville. She can be reached at 828.279.6723 or [marylovethegreen@gmail.com](mailto:marylovethegreen@gmail.com).



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# Landscaping for today

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Blueberries are a popular plant in edible landscaping. Krista Slavik photo

▣ BY BENJAMIN PORTWOOD ▣

**E**dible and ecological landscaping is a trend that is sweeping the nation.

It combines aspects of many different types of gardens – rain gardens, ornamentals, fruits, berries, culinary herbs, butterfly gardens, cut flowers, and vegetable gardens – in a beautiful, interactive landscape, that is low maintenance, resilient in both drought and flood, produces food and herbs, and helps support local ecosystems, all at the same time.

The key is to foster connections in the yard. Good connections between plants, living soil fertility, pollinators and songbirds, increase the health and vigor of the plants growing in your yard. Choosing plants that produce food or scent

as well as beauty creates connections between humans and the landscape, and that connection ultimately helps us become responsible stewards of the land.

## Rainwater harvesting

The recent rainy years have not erased the memory of the severe droughts in the last five years. Cisterns are a great way to capture rainwater for use in annual vegetable gardens or to wash your car, but rain gardens are the least expensive way to make your landscape water-resilient in both drought and times of flood.

Rain gardens store water in the soil for use by bushes and trees. They are concave areas built into your yard, which fill with water

directed to them from downspouts or the overflow of a cistern. It can be one basin, or a series that fills sequentially, with the overflow from one moving to the next. The water in each basin slowly seeps into the ground, creating a moist plume of water going downwards. Trees and bushes can “stick a root in” to access the water, but much of it will help to recharge ground water, or even create a spring further down a slope. Rain gardens are the easiest way to passively irrigate your landscape, making it resistant to both drought and floods.

## Edible landscaping

Incorporating perennial food-producing plants is one of the best investments that you can make in

a landscape. Planting perennials, which live for many years, is the easiest way to have an abundant garden because the plants do most of the work.

There are many examples of food plants that are beautiful and hardy (low-maintenance) and can be integrated into an edible landscape. Fruit trees like disease-resistant apples, pears, cherries, figs, asian pears, persimmons, pawpaws, plums and pomegranates are high on the list, as are walnuts, chestnuts, and hazelnuts.

There are a surprising number of perennial vegetables, as well. The most obvious ones are asparagus and rhubarb. We can add to that list sorrel, sochan, anise-hyssop, redbud flowers, chicory, fennel, horseradish, nettles, chives, lovage





Muscadine vine growing along a wall. (above) Rainwater harvesting is important component in landscaping. Benjamin Portwood photos



and daylily. The trick is to arrange all of these plants in your yard in a way that is aesthetically pleasing.

A mature edible and ecological landscape has a transcendent quality of abundance and life. It is a combination of enough water, a good, living soil with plenty of organic material, populated by lush, living plants to both enrich the soil and make beautiful flowers that attract butterflies and other beneficial insects. A garden like this is a joy to experience and is the smartest way to sustainably manage your landscape.

*Benjamin Portwood is a founder of Edible Yard & Garden, which operates in Asheville and Atlanta. He received training at the Montsant Permaculture Institute in Catalunya, Spain, where he spent two years in an apprenticeship program learning how to use plants to develop ecologies and produce food. He has been designing and installing rainwater-harvesting systems, and edible and ecological landscapes since 2008. Along with Edible Yard and Garden, he is currently developing a 17-acre sustainable farm in Barnardville. He derives great joy from designing garden beds and planting trees. [www.edibleyardandgarden.com](http://www.edibleyardandgarden.com) or 404.825.0139.*

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# Re-energizing the community with solar

□ BY ERIKA SCHNEIDER □

Solar energy has received significant attention in Western North Carolina lately, but nowhere is the recent solarization more strikingly visible than on Biltmore Avenue in downtown Asheville. Cantilevered off the south-facing parapet of the building that houses American Folk Art and Framing, four impressively large photovoltaic (PV) arrays are silently producing electricity. However, the statement they make is anything but mute; rather it is a strong declaration that this community embraces sustainability and innovation.

A leader on the revitalization of downtown Asheville since the 1980s when most of the buildings along this now vibrant stretch of galleries and restaurants lay derelict, Jim Samsel, AIA of Samsel Architects and Beaumont Street, LLC (property owners) is again, behind the new energy that is transforming the face of Asheville. "The buildings have excellent solar access and we were keenly aware of the high visibility the project would have. The PV panels allow us to make a strong statement about our values as a business and as members of our downtown community. We hope more downtown businesses and building owners are inspired to make similar investments in solar energy," said Samsel of the newly commissioned system.

The architectural uniqueness of this solar installation is the result of design challenges that were posed by a roof with many obstructions and limited space. Mounting 57 of the 117 modules that comprise the 34-kilowatt system on customized racking allowed for maximum energy production for Samsel Architects and American Folk Art & Framing.

With an estimated yearly production of nearly 46 megawatts,

Samsel Architects' goal is to make the firm net-zero, meaning that they will produce an equivalent amount of electricity that they consume on

we face from coal burning power plants, require us to all be an active part of the solution moving forward. By investment in clean energy and

and all who see it remains to be seen, but it will undoubtedly inspire for years to come and stand as testimony to the environmental stew-



Solar panels in downtown Asheville. Duncan McPherson, Samsel Architects photo

an annual basis. Sophisticated online monitoring will allow them to track the system's performance and measure this goal.

Duncan McPherson, Principal/Vice President at Samsel Architects, emphasizes their commitment to reducing their energy impact by stating "WNC has seen the reality of global climate change through recent floods, mudslides, droughts and record temperatures. These global concerns, combined with the regional air and water quality problems

taking our business to net zero, we believe we are part of that solution."

Economics was also a keen factor in their decision to install solar. McPherson says that solar PV has "evolved to the point where it is simply a sound, long-term investment. As the known costs of coal-fired electricity continue to rise and the costs of solar power continue to fall, the investment should be more valuable over time."

The impact of this very prominent system on downtown Asheville

ardship, smart business sense, and creativity that Samsel Architects has brought to the southern Appalachian region since 1985.

*Sharing solar success stories is a high-point of Erika Schneider's work as Director of Communications with Sundance Power Systems. A former science teacher, with a master's in biology, she has been working in the solar industry for over seven years and is dedicated to the transition to clean energy technologies. Erika has previously served on the Board of the WNCGBC.*



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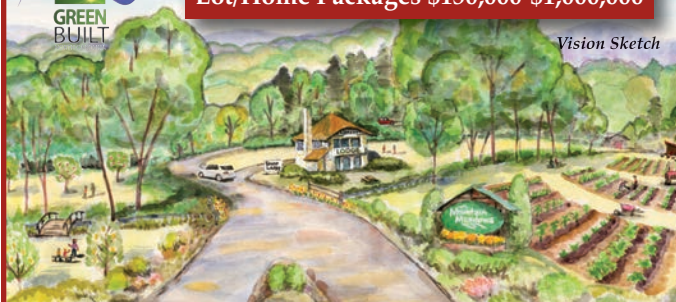
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# Have you read your homeowner's manual?

## Developing a manual on how to operate and maintain your home

□ BY MARCUS RENNER □

The last time I bought a car it was used.

In the glove box I found not one but two different owner's manuals. I've used the manuals to figure out the radio, find out recommended service and maintenance requirements, learn tire pressure needs and a few other very valuable pieces of information that have kept the car in top mechanical shape. The manuals tell me how each system within the car is supposed to operate and what needs to be done to keep each system operating at maximum efficiency. I want my car to operate at maximum efficiency because my operating costs will be lower and the car's life will be prolonged.

That same car also had an impressive dashboard with a few extra gauges that were not familiar to me. With use, I discovered that there were many, many lights alerting me to maintenance times and potential problems (thanks for the reminder air bag replacement light). My car even lets me know when I'm being careless with different sounds indicating when the door is ajar or the lights were left on.

Over the years, I've pondered why we do not receive owner's manuals when we buy our homes. Just like cars, our homes are a con-

glomeration of systems that interact together to (ideally) give us comfort, shelter, and a better life. Homes generally cost a lot more than cars and we spend way more time in them. Yet when you purchase a home, if you're lucky, you may find the dishwasher manual crammed into the back of a kitchen drawer.

Since we spend so much time in and money on our homes, we trust in the builder and building code requirements to ensure they are safe, healthy and efficient. Keep in mind, a house built to minimum building code standards is a "bottom of the barrel" home. We make sure that our cars are built to greater than minimum highway safety standards. Why not tougher construction standards for our homes?

Our homes don't come with a dashboard either. There are a myriad of things that we need to be monitoring in our homes (especially in this climate). Generally, everything boils down to temperature, humidity and energy use. Homeowners often monitor the temperature inside their home.

But what is going on in the attic, walls or crawlspace?

Oftentimes, a homeowner only finds out that their home has an insufficient system when a problem occurs. The bottom line is, problems in homes cost money and the



Melted plastic from a gas water heater. Flue gasses were entering the home. This is potentially deadly.  
Marcus Renner photos

longer a problem exists, the more money it takes to solve it. The solution is that all homeowners need to understand every system in their home, know how these systems in-

teract with each other, set up a monitoring system for the home and have a manual to offer solutions.

As energy auditors, we go into



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Completely blocked bath fan. (above)  
Saturated insulation and excessive mold. The owner found this after the tenant reported being sick. The water heater failed and flooded the crawlspace. The issue existed for two months before anyone found out. (right)



hundreds of homes and regularly see the same issues because of a lack of a homeowner's manual.

Here are some of the more common issues we discover:

■ **Foundation vents in crawlspaces** – crawlspaces are the worst foundation system known to man. They trap moisture and create a petri dish environment for fungus and insects. Foundation vents are supposed to be opened in the summer and closed in the winter. If the vents stay open year round cold air causes comfort issues, can freeze pipes, and can make the heating system work overtime. If the vents stay closed year round the moist air can't get out and mold can grow on the construction materials we call mold food. Unless a crawlspace is encapsulated there is mold in it.

■ **Bath fan ventilation:** bath fans remove moisture from the wettest place in our homes. If they are not vented to the outdoors, moisture can build up in the attic and cause mold and rot. We have to keep in mind that the lowest bidder builder may not vent the fans outside.

■ **Garden hoses:** when the temperature drops below 20 degrees the phones of all the plumbers in town start ringing off the hook. Frozen pipes can cause extensive and expensive water damage. Many times a garden hose connected to a spigot is the issue. Outdoor spigots are designed to be self-draining. They cannot drain when there is a hose connected to them.

■ **Gutters:** clogged gutters can al-

low hundreds of gallons of water to come in contact with building materials. Left unchecked, failing gutters can rot fascia boards and eventually lead to structural failures. What could have been a quick and inexpensive cleaning job can lead to thousands of dollars in damage.

Our homes interact with extremes – temperatures nearing 100 degrees to well below zero, weeks of bone dry to many inches of rain at a time, humidity that you can almost swim through, bugs, birds squirrels and fungus that all want to live in and eat our homes. We need a vigilant eye and a process to keep ahead of the environment we live in.

An owner's manual will help keep your home running in tip-top shape. Create a list of all the systems in your home and document the recommended maintenance required. Start a home calendar that will alert you to the tasks required and their frequency. Have your home regularly inspected by a professional. Pre-emptive planning and inspections will save you thousands of dollars in repair costs. Do yourself and your home a favor and treat it just as good as that car parked out front.

*After 20 years in the green building industry, Marcus Renner became co-owner of Conservation Pros Inc., a local building performance contractor. Conservation Pros conducts energy audits and performs the work to make buildings more efficient, comfortable, healthy and durable. He can be reached at [marcus@conservationpros.com](mailto:marcus@conservationpros.com) or 828.713.3346. [www.conservationpros.com](http://www.conservationpros.com)*

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# Choosing green materials



Popular bark siding. Highland Craftsman photo

□ BY MAGGIE LESLIE □

There are so many products and companies out there that claim to be green it makes it very difficult to tell which products really are green and which are not. The truth is, there aren't many products that are completely sustainable. Instead, decisions should be based on a list of criteria. The Environmental Building News' Greenspec® product directory breaks products down into a few basic categories, and I added a few extra criteria that I think are also important to consider:

- Products made with salvaged, recycled or agricultural waste.
- Products that conserve natural resources.
- Products that save energy or water.
- Products that contribute to a safe, healthy built environment.
- Locally manufactured products.
- Fair trade.
- Carbon neutral.
- Minimally packaged.

A great way to assess the true impact of a product is to look at it in terms of a lifecycle assessment, which analyzes the product from resource extraction, through production, use and disposal. According to Greenspec, a lifecycle assessment is "the science of the examining the environmental and health impacts of products ... A green product is one whose life cycle impacts are low." Unfortunately, life cycle assessments are very difficult to do using comprehensive and consistent protocols and therefore not widely available yet.

## Products made with salvaged, recycled or agricultural waste

This category comes first, because it is always better to reuse and recycle products before creating new ones. Considering that buildings create 136 million tons of construction and demolition waste in the U.S. (approximately 2.8 lbs per person, daily), efforts to reuse and recycle could have a huge impact on reducing waste. Salvaged flooring, for example, is beautiful plus adds character to a home that new

materials cannot. Some products can reduce the need for other products – for example, concrete floors can be stained to look very attractive and there is no need for an additional layer of material. Next, look for recycled content materials. Post-consumer recycled content means the waste used can no longer be used for its original intended purpose, such as carpet made of old soda bottles. Pre-consumer or "post-industrial" means waste diverted during the manufacturing process. Choose post-consumer over post-industrial materials wherever possible.

## Products that conserve natural resources

Products made from rapidly renewable materials are the next best options. These materials can be harvested and then renew themselves quickly (typically under 10 years), unlike hardwoods which can take hundreds of years to return, if ever. Cork and bamboo floorings are examples of products made from rapidly renewable resources (though the products are shipped great distances).

Some lumber has been third party certified to have been sustainable harvested. The two most common certifications for sustainable wood

are Forest Stewardship Council Certified (FSC) and Sustainable Forestry Initiative Certified (SFI). SFI certified wood is second party certified, not third, and is currently not recognized as a sustainably harvested wood by the U.S. Green Building Council's LEED standards, though SFI is a good option if FSC is not available, is cost prohibitive or shipped from great distances.

Durable products are also in the natural resource conservation category. If you build the greenest home in America and then it rots from moisture problems and the materials are sent to the landfill, we are no better off. This is why some people even consider vinyl siding to be a green product. It is toxic to produce

## Summary of Greenspec Product Standards

### Products made with salvaged, recycled or agricultural waste content

- Salvaged products
- Products with post-consumer recycled content
- Products with pre-consumer recycled content
- Products made from agricultural waste material

### Products that Conserve Natural Resources

- Products that reduce material use
- Products with exceptional durability or low maintenance
- Rapidly Renewable Products

### Products that avoid toxic or other emissions

- Natural or minimally processed
- Alternatives to ozone depleting substances
- Alternatives to hazardous products
- Reduces or eliminates pesticide treatments
- Reduces stormwater pollution
- Reduces impacts from construction/demolition

### Products that save energy or water

- Building components that reduce heating and cooling loads
- Equipment that conserves energy
- Renewable energy
- Fixtures and equipment that conserve water

### Products that contribute to a safe, healthy indoor environment

- Products that don't release significant pollutants into the building
- Products that block introduction, production or spread of contaminants
- Products that remove indoor pollutants
- Products that warn occupants of health hazardous
- Products that improve light quality
- Products that help control noise
- Products that enhance community well being

## Great Resources for Choosing Green Materials

- *Cradle to Cradle: Remaking the Way We Make Things*, by William McDonough
- [www.BuildingGreen.com](http://www.BuildingGreen.com)
- [www.GreenHomeGuide.com](http://www.GreenHomeGuide.com)





Bar top. (above) JAG Construction photo  
Bamboo balusters.

Cady & Guyton Construction photo



with a high-embodied energy (energy intensive to manufacture) and may never biodegrade, but it is very durable and low maintenance.

### Products that contribute to a safe, healthy indoor environment

Natural and minimally processed materials typically have less chemical additives that can have a huge impact on human and environmental health. Formaldehyde is common in many engineered products because it acts as a binding agent. There are increasing efforts to replace formaldehyde with less toxic binding agents, for example cabinet grade formaldehyde-free plywood, for instance, is available and manufactured locally in Old Fort.

Almost every chemically based product from paints to adhesives is now available in a low VOC (volatile organic compound) version. Plus there are natural and locally manufactured products available.

GreenSeal is a third party certification to look for that is available on many products such as paints and finishes. Additionally, Scientific Certification Systems (SCS) has certified many low toxic materials through its Environmentally Preferable Products and Sustainable Choice certification programs. Filtration products that can reduce indoor air pollution are also in this category. In addition to GreenSeal, also look for Greenguard certification on products such as insulation, Green Label Certification on carpets and the SCS indoor air certifications on flooring and furniture.

### Products that save energy or water

Some products are considered green not because of their raw materials, but because once you install them they reduce the environmental footprint of the building. This includes materials such as low flow fixtures that save water or insulation and light bulbs that reduce the energy needs of a building. Look for the Energy Star label on lighting an appliance options and the EPA's WaterSense label on low flow, water saving faucets, fixtures and toilets. Once you have reduced the overall energy and water needs, consider renewable energy equipment that actually produces energy, such as photovoltaic panels.

### Fair trade, fair wage, carbon neutral and local

This category may come last, but it is certainly not least. Many green materials fulfill the environmental tenant of the definition of sustain-

ability, but true sustainability addresses social and economic sustainability as well. Purchasing products that are produced by companies that pay workers a fair wage, and/or that support the local economy means growing a sustainable economy and a sustainable community. Plus, locally produced products help cut our carbon footprint by reducing the transportation impacts and support our local economy.

Currently we can't buy everything locally, but you can still choose products that are making positive impact somewhere, like developing sustainable economies or creating social equity in other countries. Many companies are now purchasing Carbon Offsets or Renewable Energy Credits, claiming that their products are produced with 100 percent renewable energy. This is a great step, but make sure their claims are legitimate and that they are working to minimize their impact, as well as offset it.

Now that we have addressed the different criteria for materials, let's apply them to insulation as an example.

■ Spray Foam – saves energy, contributes to a healthy indoor environment.

■ Blown Cellulose – saves energy, recycled content, avoids toxic emissions.

■ Recycled Blue Jean Batts – saves energy, recycled content, avoids toxic emissions.

■ Formaldehyde-free Fiberglass – saves energy, some recycled content, avoids toxic emissions

Now, apply these to the needs of your own home. Could moisture be an issue or are you worried about drafts? Consider spray foam insulation, it creates an air tight envelope and inhibits mold growth. Are you most concerned about your environmental impact? Consider recycled blue jean batts. Too expensive? Consider cellulose, it is recycled and easily installed. Unfortunately, when it comes to green products there are few perfect products but by considering the impacts of your choices you can reduce the impact on the environment substantially plus create (or renovate) a healthy and unique home.

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## Utility incentives

■ In 2007, the North Carolina legislature passed a Renewable Energy Portfolio Standard, which requires utilities to increase their use of renewable energy and offer incentives for energy efficiency. Utility providers are now offering impressive incentive programs to meet those requirements.

■ N.C. Green Power will pay a per kilowatt rate for electricity generated from a renewable resource that is fed onto the grid.

### Duke Energy/Progress

#### Residential

■ The Home Energy Improvement Program pays rebates of \$190-500 for a variety of energy-efficient upgrades, including air duct repair/replacement, air sealing and attic insulation, HVAC audits, HVAC replacements, high-efficiency window AC units and water heater replacements. [www.duke-energy.com/HEIPrebates](http://www.duke-energy.com/HEIPrebates)

■ The Residential New Construction Program helps consumers find the most energy-efficient, durable and comfortable new homes available today. Many of these homes come with a Heating & Cooling Energy Usage Limited Guarantee. Over 230 builders participate on the program. [Duke-energy.com/mynewhome](http://Duke-energy.com/mynewhome)

■ An Energy Conservation Discount is available for all ENERGY STAR-

certified homes. Email: [ECDiscout@duke-energy.com](mailto:ECDiscout@duke-energy.com)

■ The SunSense Solar PV Program pays an upfront rebate or \$500 per kilowatt AC, plus a monthly bill credit of \$4.50 per kilowatt for installed photovoltaics. [www.duke-energy.com/sunsense](http://www.duke-energy.com/sunsense)

#### Builders

■ The Residential New Construction Program provides incentives to builders and contractors building energy-efficient homes in the Duke Energy Progress service territory. [www.duke-energy.com/newhomes](http://www.duke-energy.com/newhomes)

#### Commercial

■ The Energy Efficiency for Business Program offers incentives for energy-efficient equipment and technical assistance in new construction and retrofit projects. Rebates can pay for up to 75 percent of project costs. [www.duke-energy.com/carolinas-business](http://www.duke-energy.com/carolinas-business)

### Duke Energy

#### Residential

■ Smart Saver offers up to \$550 in incentives and savings on qualifying equipment and services. [www.duke-energy.com/smartsaver](http://www.duke-energy.com/smartsaver)

■ Home Energy House Call is a free in-home energy review for eligible Duke Energy customers. It includes a free Energy Efficiency Starter Kit, valued at \$30. [www.duke-energy.com/house-call](http://www.duke-energy.com/house-call)

■ ENERGY STAR-certified homes qualify for lower electric rates. 800.777.9898.

#### Commercial

■ The Smart Saver Incentive program offers businesses cash for installing high-efficiency lighting, HVAC, pumps and other qualifying equipment. 866.380.9580

### PSNC

#### Residential

■ Residential customers whose homes meet the EPA's ENERGY STAR for New Homes guidelines are eligible for PSNC's Residential Rate Schedule 102, which is a discount of \$0.05 per therm.

■ The company has implemented a \$100 rebate for replacing gas water heaters and furnaces with high-efficiency versions in residential buildings: [www.psnenergy.com/rebate](http://www.psnenergy.com/rebate).

■ Residential customers with homes built prior to 1993 are eligible to

### Local Government

#### City Of Asheville

■ A \$100 permit-fee rebate for Green Built NC certification; \$100 for ENERGY STAR certification.

■ A \$50 permit-fee rebate for each of the following: geothermal heat pump, solar energy system, wind energy system and stormwater/graywater collection device to be used for irrigation.

■ 50 percent rebate for plan review fees for commercial projects seeking LEED certification.

#### Town Of Black Mountain

■ A \$500 permit fee rebate for buildings certified under the Green Built NC or LEED programs.

#### Catawba County

■ A 25 percent permit fee rebate for buildings certified under the Green Built NC, ENERGY STAR, NAHB Green or LEED programs.

receive a \$25 in-home energy audit.

#### Commercial

■ Commercial customers whose buildings meet LEED-NC certification are eligible for PSNC's Rate Schedule 127, which is a discount of \$0.05 per therm.

■ \$100 rebate for replacing older gas water heaters and furnaces with high-efficiency versions in commercial buildings: [www.psnenergy.com/rebate](http://www.psnenergy.com/rebate).

■ PSNC offers \$25 home energy audits for natural gas customers. [www.psnenergy.com/audit](http://www.psnenergy.com/audit)

*For detailed information on financial incentives, visit [www.dsireusa.org](http://www.dsireusa.org).*

# Incentives for building green

### Federal

#### Individual Renewable energy

■ Through the end of 2016, a 30 percent tax credit for solar water heat, photovoltaics, wind, fuel cells, geothermal heat pumps and other solar technologies with no caps.

#### Businesses Renewable energy

■ A 30 percent tax credit is available for investing in solar water heat, solar space heat, solar-thermal electric, solar-thermal process heat, photovoltaics, wind, biomass, geothermal electric, fuel cells, geothermal heat pumps, Combined Heat and Power (CHP)/cogeneration, solar hybrid lighting, direct-use geothermal and microturbines. Available through the end of 2016.

■ Accelerated depreciation (Modified Accelerated Cost Recovery System – MACRS) for eligible renewable energy technologies.

### North Carolina

#### Individual Renewable energy

■ A 35-percent tax credit for passive-solar space heat, solar water heat, solar space heat, solar-thermal electric, photovoltaics, wind, biomass, hydroelectric, geothermal heat pumps, solar pool heating and daylighting. Available through the end of 2015. Caps vary by technology.

#### Businesses Renewable energy

■ A 35 percent tax credit for passive-solar space heat, solar water heat, solar space heat, solar-thermal electric, solar-thermal-process heat, photovoltaics, landfill gas, wind, biomass, hydroelectric, renewable transportation fuels, geothermal heat pumps, spent pulping liquor, direct-use geothermal, solar pool heating, daylighting, anaerobic digestion, ethanol, methanol and biodiesel. Available through the end of 2015. \$2.5M cap for all technologies.





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# Home in a forest

Why the Appalachian Mountains are one of the hardest places to maintain a home



VandeMusser residence. Jay Coble photo

□ BY MARCUS RENNER □

When a tree falls in the forest, does it rot? Of course the answer is yes. When we build our homes out of trees, can they rot? Same answer.

The beautiful Appalachian Mountains have a dark side. Our climate is one of the most challenging climates for houses. Technically called a "mixed humid climate," the Appalachians subject our homes to heat, cold, dry and

wet. The ecological diversity we all love continually exposes our homes to all manner of creatures that want to live in and dine on our shelter. High humidity levels support a microcosm of fungi, such as mold and mildew. Our homes are an intricate system filled with other systems that are designed to keep us comfortable. We have to be diligent to fend off the environmental extremes of the Appalachians.

Let's start with the creatures. Our

homes emulate natural conditions that support the fauna of our area. For example, crawlspaces are like rocks. Mice, rats, snakes and other animals like to hide and live under rocks. Provide an entry point and they will make themselves at home in your crawlspace. Conveniently, crawlspaces provide your cute, new housemates with lots of necessities. The insulation makes great nesting material and leaks provide water.

Additionally, wood siding can

provide a home to numerous insects, all well evolved to get into wood. Once a tree, wood can be burrowed into by carpenter bees, ants and other insects. Insects bring the predators. Wood peckers can destroy siding when they go after carpenter bee larva. To top it off, attics are like shelter in a tree canopy; dry and protected. If your attic isn't air sealed your attic is also nice and warm in the winter. Soft, warm protected shelter – who



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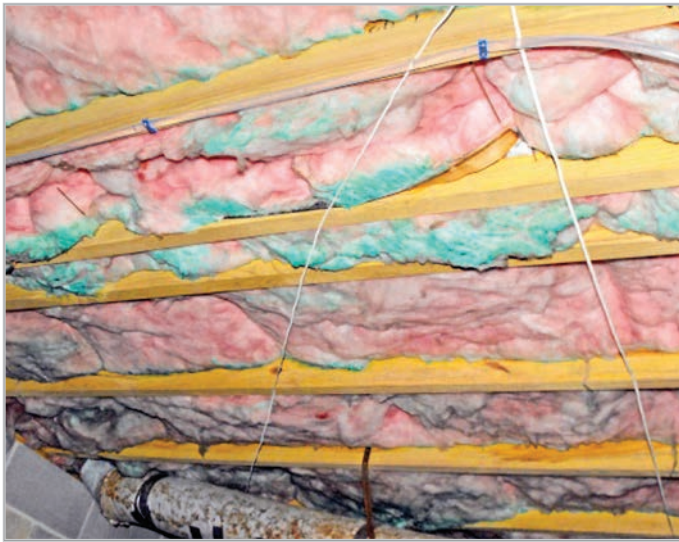
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Green fungus growth on insulation in a crawlspace is a serious health hazard.  
 Marcus Renner photo

would turn that down on a cold Appalachian night?

Our seasonal changes play a big part in the longevity of our homes. Appalachian winters are cold and dry. Humidity levels can dip to thirty percent. Conversely, our summers are hot and wet. Humidity can park itself at above ninety percent for weeks on end. This subjects our home's materials to seasonal expansion and contraction and wetting and drying. This is noticeable when windows and doors won't open easily in the wet summer.

The high humidity acts upon our building materials as it would on that fallen tree. Fungi spores are given the moisture they need to grow. I'm sure many of us have had leather belts and shoes that have been covered in mold at the back of the closet. Our summers offer us the ability to have our windows open to let the cool mountain air enter. The windows are also pathways for moisture. Our crawlspaces are another moisture pathway.

So, why aren't our homes turning into piles of rotted and chewed wood chips?

Well, in reality they are. We are constantly maintaining our homes in an endless battle to keep them in one piece. That battle is costly. Depending on how a home is constructed, lifetime maintenance costs can be far more than the original purchase price.

### What can a homeowner do?

■ Know your home. Investigate the nooks and crannies such as attics and crawlspaces.

■ Monitor your home. Have humidity and temperature readings of all areas; attic, interior, exterior and foundation.

■ Regularly inspect your home. Routinely look at all home systems and make sure they continue to operate effectively.

■ Develop a home maintenance plan. Build a schedule to help remember when systems need regular maintenance.

■ Regularly condition the interior of your home. Periodically close the windows so that the house can dry out. A dehumidifier can do the trick, but our air conditioners are the best dehumidifiers. Fungi function best above 70 percent relative humidity. Regularly dry your home to 60 percent or lower.

■ Encapsulate your crawlspace. Crawlspaces are the world's worst type of foundation system.

■ Seek the advice of experts. If you have trouble understanding the intricacies of your home or notice problems, a home energy inspector will walk you through the entirety of your home and offer assistance in improving system flaws and solving issues. Being a proactive homeowner will keep your Appalachian home from going the path of the fallen tree.

*After 20 years in the green building industry Marcus Renner became co-owner of Conservation Pros Inc. a local building performance contractor. Conservation Pros conducts energy audits and performs the work to make buildings more efficient, comfortable, healthy and durable.*

*He can be reached at [marcus@conservationpros.com](mailto:marcus@conservationpros.com) or 828.713.3346. [www.conservationpros.com](http://www.conservationpros.com)*



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# Cutting energy use

## Prioritizing cost-effective weatherization for existing homes

□ BY BRIAN KNIGHT □

It can be tough to get excited about invisible influences that affect our homes, but one of the most important is proper weatherization of existing homes and buildings. The best way to improve one's environmental impact is to spend less money on monthly energy costs. Weatherizing existing homes is an incredible opportunity to accomplish this while also increasing the dwelling's health and comfort.

In a recent blog post at the wildly popular WNC Green Blog collective, I claim that the most important priority for green homes is to reduce monthly energy costs as much as possible. Despite all the pretty finishes and exciting technologies, the most important thing to do is keep un-renewable energy use to a minimum if not be a net producer of renewable energy. This is true for new and existing construction. It's possible for an existing home with low energy costs to be more sustainable than a new green home built in a more rural setting. Personally, I think it's the monthly, energy cost number that defines it.

The best way to figure out a particular home's deficiencies is to hire a professional energy auditor to evaluate the best places for improvement. In most existing homes there are three particular projects that can have fast financial and environmental payback and will make homes more comfortable.

### Air seal, air seal, air seal!

Nothing is more invisible than air movement, and few things are more important. One can expect to save 5-30 percent of their monthly energy costs by sealing air leaks. For most homes, the best way to increase comfort, improve the environment and save money is by reducing uncontrolled air infiltration and exfiltration.

One of my favorite things about new construction is that it's so easy to create an airtight dwelling. Existing homes are much more chal-

lenging. Even the newest homes built today are, in my opinion, too leaky. But the improvement needed for existing homes is often immense, as is the level of cost effectiveness associated with access.

### Where to start an air-sealing or insulation project?

Most energy auditors and home performance contractors will begin an air-sealing project by measuring

the leakiness of a building envelope with a blower door test. This is the ultimate diagnostic test that puts a number on how well a building envelope performs. Generally, the results from a blower door test are much more accurate and revealing than the R-values of building components. I repeat: Blower door numbers before R-value!

By testing at the beginning of a project, we can measure the success of improvements and often times

the blower door can reveal hidden sources of air leaks.

Blower doors are extremely helpful but not mandatory, and people can improve their existing homes without them. Air movement in homes can be complex and dynamic. Generally, air enters (infiltrates) the lower areas of a home and exits (exfiltrates) the upper areas. Even a mild breeze can change the physics as can exhaust fans and different temperatures.



Conducting a blower-door test is essential to creating an airtight living space. Duncan McPherson, Samsel Architects photo



The most cost-effective places to start are the areas that are most accessible at the bottom and top of a home. In the basement, masonry to wood and other transitions and penetrations are good places to focus efforts. Replacing weather stripping is more important on basement doors, as is sealing windows and other possible cracks in the wall planes of lower levels. A simple strategy is to look for daylight coming into pitch black spaces. Vented crawlspaces should strongly consider being sealed, insulated and possibly conditioned.

## Air-seal the ceiling before adding insulation!

Most existing homes have flat ceilings with attic insulation on the floor of the attic/flat ceiling plane of the top level. This is probably the most overlooked area to focus air-sealing efforts, even for professional home energy auditors. It can be a pain to work in an attic but it's more accessible than leaky walls, and the walls are usually trying to leak air through the attic. There is usually a strong air and vapor pressure at the ceiling plane which makes it a very effective and important place to air seal.

In order to perform this work, its necessary to peel back or push aside any insulation that is blocking the penetration or transition needing to be air sealed. Even a small, ceiling mounted light fixture can leak enormous amounts of air (and moisture) through the electrical junction box and gaps between the junction box and finished ceiling.

Recessed cans (micro chimneys) are one of the worst offenders. Even for the newest "airtight" recessed cans, its necessary to build a box or cap around them to properly seal them off. Pay very close attention to areas around upper cabinets, interior walls and dropped ceilings. Dirty colored insulation and spider webs are visual clues of air leaks. Cold, windy days are great times to feel for leaks with your hand, a surprisingly effective tool for locating them.

Perhaps the biggest leak and challenge involves the attic access door. Fold down stairs are a pain to fix and air seal but should have a very fast payback if done well. An increasingly popular method for efficient homes with vented attics is to put the access door on an exterior wall of a gable end. I think this is good strategy for existing homes when also dealing with exterior siding renovations.

## What about walls?

Walls are usually the least cost-effective areas to air-seal. For one thing, walls are at the average neutral pressure plane of a house but mainly they are only accessible during exterior or interior finish renovations. I think one of the more cost-effective methods of air sealing walls is to remove the window trim to air-seal between the stud framing and window frame. It's possible that replacing weather stripping on windows is a wise investment too. On the exterior, be careful about caulking the bottom window trim as you could be trapping a bulk water escape pathway.

## Materials

I recommend the best air-sealing materials available. High quality tapes like 3M's 8067 or the vapor permeable Euro tapes are my first choices when appropriate. Quality urethane caulks are a good choice for most caulk jobs especially for anything involving masonry and exterior exposure. We've also started using acoustical sealant available in big cartridges from drywall suppliers for some locations that will stay dry yet have lots of expansion and contraction.

Spray foam is a nice tool for gaps larger than one-quarter inch, and I tend to prefer the window and door versions as they seem to stay more flexible over time. I do not recommend any water based spray foams as the ones I have tried quickly turn to dust. A light mist of water to the substrate will do wonders to a polyurethane spray foam can application. Still, I think most locations where people reach for the spray foam would be better served with high quality flashing tape.

## Add insulation in the attic

If you skipped any of the above about air sealing the ceiling plane, go back. NEVER add insulation to an attic floor without air-sealing it first!

Adding fluffy types of insulation to the floor of a vented attic is a very cost-effective weatherization upgrade, sometimes even for new homes. Cellulose is my first choice followed by blown fiberglass. I do not recommend fiberglass batts but am OK with leaving existing batts in place and blowing over the top – as long as they were peeled back to do the air-sealing first! Remember that blown insulation can settle 10-30 percent after the initial installation.



A well-insulated attic door and attic insulation can cut heating costs by half.

The lowest level of insulation allowed by prescriptive law in WNC for attic floors is currently R38. This means anything less than 11 inches of fluffy insulation does not readily meet code. The 2012 international energy code requires R49, which is 14 inches of typical fluffy insulation. What exactly is cost-effective depends on many variables and is up for debate, but I am of the opinion that people should not have less than what current international law requires and represents a very cost effective level of insulation. Translation: your ceiling should have 14 inches or more of settled fluffy insulation on the attic floor.

Insulation performance drops dramatically with weak links and thermal bridging. The attic door or hatchway should be as close as possible to the level of insulation on the attic floor. Building a dam around the attic access is usually necessary to achieve the thicknesses needed for good, thick R-value performance.

My personal home's attic insulation upgrade has dramatically cut my heating costs. Here's what I did: ■ Two-inch XPS foam separates the 2-by-10 and 2-by-6 framing from the ceiling joists and acts as a dam to hold back the thick levels of fluffy insulation about to be added. The door is 3 pieces of 2-inch XPS foam taped together and rabbeted for a tight friction fit. While not quite R 50, it's a solid improvement over the loose piece of drywall it replaced and is very airtight. I waited 4 energy intensive years before deciding to take a peak into my attic's insulation condition. I cut my home heating oil consumption in half and dramatically reduced the number of summer days needing to turn on my AC.

## Seal accessible ductwork

Most existing homes have ductwork in the basement, crawlspace or attic. If any of these ducts are accessible and have not already been sealed, this can be seriously easy money and increased comfort. Hire someone or get a large bucket of HVAC mastic and seal every possible metal joint or transition. Pay particularly close attention to the main air handler. Every accessible metal seam should be meticulously sealed with nickel thick layers of mastic.

Ductwork with air conditioning will probably be insulated. Depending on how accessible and leaky the ductwork is, it can make sense to pull back the insulation to seal the transitions and connections to the main trunk lines, air handler plenums and registers. This is another area where an energy audit professional can offer expertise and measure performance improvements with a duct blaster test. Sealing ductwork is most important in vented crawlspaces, vented attics and unfinished basements. If you are building new or adding on, never put ductwork in unconditioned spaces.

Every home is different and will likely have differing weatherization needs. There are several important areas of concern avoided by this article. We talk about some of them in the WNC Green Blog Collective. Don't spend any more money on wasted energy! Weatherize your home as soon as possible and enjoy the comfort, environmental and monetary benefits.

*Brian Knight is the owner of Springtime Builders in Asheville NC. Specializing in Indoor Air Quality, Cost-Effective Energy Efficiency and Building Science Best Practices.*



# Insulation 101

□ BY MAGGIE LESLIE □

There are many types of insulation. The most common type of insulation is batt or blanket type insulation (typically fiberglass) which is the least expensive, but requires more careful installation to ensure 100 percent coverage. Blown types such as fiberglass, cellulose (recycled newspaper) and foams are more easily installed, easily filling in gaps, cracks and ar-

reas around pipes and wiring. Foams have an added benefit that they also airseal all the gaps and cracks in the walls.

■ Insulation is installed to be in full contact with the air barrier (the sheet rock to the inside and the sheathing to the outside). If the insulation is not encapsulated by a rigid material on all six sides, it will not insulate properly.

■ Insulation should be installed to

fill 100 percent of every cavity.

■ If batts are installed, the insulation should be cut to fit around all plumbing, heating, and electrical penetrations in addition to other obstacles. They should be split to go behind and in front of wires and plumbing. This is to be done in such a way as to fill all cavity spaces and gaps, while NOT compressing the insulation.

■ The space behind electrical boxes needs to be fully sealed and insulated.

■ If faced (kraft or paper) batts are used in walls or cathedral ceilings, the flanges must be stapled to the face of the studs or rafters, not the side of the surface facing into the cavity.

■ Attic insulation should extend all of the way to the exterior edge of the top plate of the wall below without compression. This will require roof-framing details that allow for this, such as raised heel trusses or over-sized trusses.

■ Insulation baffles should be installed to prevent over blow into soffits and to prevent wind washing through the insulation. This means that baffle height must be no less than the thickness of the insulation.

■ Attic access openings (hatches or pull-down stairs) should be insulated to at least R-30 and weather-stripped to prevent air movement between the attic and the living space. The insulation must be glued or stapled to prevent misalignment. This is a great application for rigid foam.

■ Floor insulation must be in continuous contact with the sub-floor above. It should provide continuous

coverage with no compression of the insulation and with no gaps. Batt insulation must be cut and fit around pipes, blocking and bridging, and other obstacles so as to provide the full R-value in all spaces.

■ Band joists are insulated to at least the level of exterior walls, and cover the entire band joist area.

■ Walls between conditioned space and attic space, such as knee walls in bonus rooms, should always have a rigid material on the attic side, preferably rigid foam insulation, which will prevent air flow through the wall cavity and allow the R-value of the wall insulation to perform as intended. This rigid material must be sealed with caulk or spray foam at all connections to the framing.

■ Use single-ply headers where possible to allow for insulating headers above windows and doors. It is possible to insulate headers by using foam sheathing as a spacer instead of plywood or OSB, either between or on one side (preferably the exterior) of double headers. All headers should be insulated with rigid foam insulation (minimum R-3, i.e., half-inch foam board between two 2X10's)

■ Interior/exterior wall intersection should be framed using Ladder "T-Walls" in order to maximize the area of insulation on that exterior wall.

■ Outside and inside corners- Two stud corners or "California corners" should be used to decrease lumber and increase possible insulation levels compared to typical practice. Wood nailers and/or drywall clips should be used for ease of installing exterior and interior finishes.



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# A checklist for ducted heating and cooling equipment

Your home can be heated or cooled using electricity, gas, geothermal energy, solar energy or a combination of each. Radiant floor heating systems are an inherently efficient way to heat because there is no heat lost through duct work. Ductless minisplits are also very efficient systems that are becoming more common. However, ducted forced air heating systems can be a very efficient option if designed and installed properly. The checklist below should be considered when installing any type of ducted system.

- A room-by-room Manual J heat loss/heat gain calculation must be completed. Maximum over sizing limit for air conditioners and heat pumps is 15 percent. This will make sure you are not paying for more capacity than you need and it will ensure the system will properly dehumidify the home and run efficiently.

- Heat pumps and air conditioners have a Seasonal Energy Efficiency Ratios (SEER) rating

of at least 14 and a Heating Season Performance Factor (HSPF) of at least eight. Gas Furnaces for heat, or back up heat, should have a rating of at least 90 AFUE (Annual Fuel Utilization Efficiency). The higher the number the better.

- Locate ductwork and the mechanical unit in the conditioned space if possible. All ductwork should have an insulating value of R-8. Ductwork should be designed using Manual D.

- Consider using rigid metal ductwork for increased durability and indoor air quality. Rigid metal is easy to clean and will not trap dust or absorb moisture. Building cavities, such as floor joists, should not be used as part of the forced air supply or return system.

- All joints/seams in the air distribution system are sealed using fiberglass mesh tape and duct mastic. This includes duct connection to metal boots (in sub floor), trunk lines and air handler units. Insulating liner of ducts must

also be sealed with mastic.

- Indoor and outdoor HVAC units are "matched" according to the ARI Directory or the manufacturer's listing.

- Correct charge of refrigerant has been installed per manufacturer's specifications.

- Registers and diffusers have proper throw and spread to keep rooms properly conditioned as the load specifies.

- Duct dampers should be installed and accessible on supply vents. These dampers will make it possible to adjust the flow and spread of air from the registers.

- Ducts should be sealed and then tested by a Home Energy Rater to have no more than 5 percentage leakage.

- If you are installing an all-electric heat pump, make sure to install an outdoor thermostat to control when the electric heat strips power on, this will maximize your efficiency.

- Install a programmable thermostat.

## Air sealing checklist

Air sealing is a crucial part of building a healthy, energy efficient home. Below is a checklist of items to make sure to seal when building or renovating a conventional stick frame home. A leaky home will decrease the R-value of your insulation effectiveness, create unwanted drafts and comfort issues, plus bring moisture and pollutants into a home. "Seal it tight and insulate it right!"

- Seal around windows and exterior doors with backer rod, caulk, or non-expanding spray foam.

- Seal all electrical, plumbing and HVAC penetrations between conditioned and unconditioned space with caulk or spray foam.

- Seal the bottom plate and the top plate of exterior walls and walls to the attic with caulk or sill seal.

- Seal band joists with caulk, spray foam, or gasketing between top plate and band joist and between band joist and sub-floor. Any penetrations in the band joist must be sealed with caulk or spray foam. Any joists or other cavities that span from conditioned to unconditioned spaces must be blocked off and air sealed.

- Block, cap, and seal any chase ways that would allow unconditioned air to enter into the conditioned building envelope.

- Exterior walls behind tub and shower enclosures should be insulated. Prior to installing the tub or shower, a rigid and durable air barrier should be installed to be in direct contact with

the insulation.

- Install insulation wind baffles to block wind washing at all attic eave bays in roof assemblies with soffit vents.

- For cantilevered floor systems or floors above a garage an air barrier must block any exposed edges of insulation.

- For fireplace cavities on exterior walls, a rigid air barrier must be fully aligned with the insulated framing in the framed shaft behind the fireplace and any gaps are fully sealed with foam, caulk or tape.

- For porch roofs, a rigid air barrier must be installed at the intersection of the porch roof and exterior wall.

- For dropped ceilings, a rigid air barrier must be fully aligned with insulated framing and any gaps are fully sealed with caulk or foam.

- Recessed light fixtures, if installed in insulated cavities such as the ceiling between the house and the attic, should be rated IC (Insulation Contact) AND air-tight. Once installed they



James Pader photo

should be sealed to the drywall with gasket, caulk or foam.

- All holes or penetrations in the building envelope shall be sealed with a material capable of stopping airflow such as caulk, foam or rigid material. Fibrous insulation does not stop airflow.

— by Maggie Leslie



□ BY AMY MUSSER □

How many green builders does it take to install a lightbulb?

Lightbulbs are so easy to use that they're the subject of countless jokes. Buying a lightbulb and putting it in a residential light fixture is actually not that complicated. It's unfortunate that there are so many myths and misunderstandings out there about them.

A lot of people think that LEDs (light emitting diodes) are a lot more efficient than CFLs (compact fluorescent lamps). I'm not exactly sure why people think this, except that they must be assuming that if one costs \$1 and the other costs \$30 and they have the same light output, then the \$30 one must be more efficient.

Actually, I just checked the shelves of my local home improvement store and the 60-watt replacement CFL uses 14 watts, while the LED uses 10 watts. The LED is better, but at current costs I estimate that it takes about 72,500 hours of operation until it saves you any money over a CFL. That's about eight years of on-time, so if you don't have the money to upgrade from CFLs to LEDs right now, you don't need to feel guilty.

Did you see what else I just did there? I compared the two lamps based on their "equivalency" to the old-style incandescent lightbulb. I did that so I could remind you how inefficient those are later and make an attempt to pry them out of your hands. Incandescent lightbulbs use about five times as much energy as these newer technologies, so why anyone would want to hoard old-style lightbulbs is a mystery to me. It's like going to the gas pump and choosing to pay \$6 per gallon instead of \$1 per gallon.

Some people tell me that they're waiting until their incandescent bulbs die and then changing them



out. I like the idea of using things up and not throwing away something that works, but you really are throwing away dollars and polluting the environment. At the hardware store CFLs now cost less than incandescent lamps. But even if you already own it and assume that the incandescent lamp is free, the payback for a \$1 CFL happens in about 200 hours of operation (eight days of on-time).

One myth that's sort of true but doesn't have to be is that CFLs

have terrible color rendering. Everyone, including me, has bought one that made everything in their house look kind of green. I suspect the problem is that it costs more to make a CFL that renders colors well, putting pressure on manufacturers to produce a product that's just barely acceptable.

Fifteen years ago, I got some \$8 CFLs that were called "incandescent fluorescent" because they'd been designed to render colors almost identically to an incandes-

cent lamp. I promise, you would not have been able to tell the difference. It's not the technology's fault – it's an economic problem. I recommend that when you buy CFLs you try one and see if you like it. You can return it if you don't, or go back and buy more if you do. It also helps to buy Energy Star bulbs, because they have minimum criteria for color rendering built into their requirements.

By the way, the same issue applies to LEDs. I recently bought



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three MR16 replacements to put on some artwork in my entry hall, and they made the red look awful. I returned one of them and kept the halogen in the center of the fixture. That one gives me decent color, and the two LEDs are an efficient way to add to the brightness. My house isn't the Louvre, so it works OK.

There's a political conspiracy myth that comes around my Facebook feed and in email forwards – "Have you heard that Obama's trying to take your lightbulbs and force you to buy the toxic green kind?" Actually, the legislation was passed in 2007 (Obama took office in 2008), by Congress (which is actually how we make laws in the U.S.) with bipartisan support. So, even if you believe that the president controls what Congress does, this would mean that George W. Bush is (was) coming to take your light bulbs.

CFL and LED lighting are disruptive technologies that should make incandescent lighting obsolete for most residential applications. The bad news is that political push-back (mostly due to conspiracy theory emails) led to defunding of the phase-out in 2011. The good news is that many other countries have implemented phase-outs, and the lighting industry has largely re-tooled to produce the new bulbs. Check the lighting aisle of your local home improvement store, and you'll see more options and fewer incandescent bulbs than ever before.

Finally, there's the big issue – the mercury. CFLs contain a small amount of mercury. How much? Coincidentally, about the same amount that is emitted by a power plant to power the equivalent incandescent lightbulb. Ironically, refusal to use CFLs because of "the mercury" does nothing to reduce the amount of mercury that's out there for people to be exposed to, but instead puts it into the air so that all of us are exposed. Those who choose to use CFLs keep it inside their lightbulbs, where it can be safely recycled or cleaned up properly if one breaks.

Unless a CFL breaks, it releases no mercury at all. If it does break, you don't have to call a haz-mat team to clean it up. You should take a few easy precautions that involve duct tape, Ziploc bags and paper towels. If you don't have these things in your house already, you should really stock up. Even if

you totally botch this, the amount of mercury involved is less than 1/100 of what's in a mercury thermometer. If you're over 30, you've probably broken at least one of those in your life and not handled that cleanup properly.

But, the argument usually goes, your view of healthy living and/or parenting is to take a zero-tolerance approach to hazardous materials. No one understands where this sentiment comes from more than I do, but I'd also like to just observe that you are living on the wrong planet. Does your zero-tolerance stance on mercury extend to eating fish or fish oil? Guess where the fish get mercury? Power plant emissions is one of the big sources: air pollution eventually gets into the water, and then into the fish. It would be great if there were some easy, low-cost options for reducing power plant emissions, like using CFL lightbulbs.

Does your zero tolerance approach include other chemicals? If so, you might want to surf around the "chemicals and toxics" section of the EPA's website, where you can learn about all sorts of other stuff that I'm sure you're not using in your house. Things like candles, prescription medication, Teflon, pressure-treated wood, and cleaning products. And if you need to use them, I'm sure you're handling and disposing of them as recommended to keep us all safe.

By the way, CFLs represent only about 1/100th of a percent of annual mercury emissions in the US, and 98.9 percent of the mercury in a CFL is recovered if it is recycled properly. Most hardware stores have recycling programs, including Ace Hardware, Home Depot, Ikea and Lowe's. If you happen to live in an area where recycling isn't convenient, you can get mail-in kits.

There really just isn't any rational excuse, but if you or someone you know is determined to cling to irrational ones, then fine. The cost of doing that is about \$30 each for LED bulbs. Otherwise, spend a dollar and do the easiest, smallest thing possible to benefit your planet. Buy a CFL lightbulb. – it's the least you can do.

*Amy Musser is Founder/Principal of Vandemusser Design PLLC, an Asheville-based home energy efficiency company. A licensed mechanical engineer, she provides design assistance, certification and audits to support high performance homes.*

## Design elements of a simple rain barrel:

□ BY RAYMOND THOMPSON □

These are some basic tips that can be used to build an effective low maintenance rain barrel.

■ Use a full size overflow connected to a drain that outlets draining away from the home. This protects the homes siding and foundation. 3" or 4" SCH 40 PVC drain pipe affixed to the barrel with a high quality tri-polymer caulk (Lexel, Geocel, etc.).

■ Use a fine filter screen. A tough window screen works well. It allows the spigot/valve to clear any debris from the barrel.

■ Elevate the barrel for ease of use. Thirty inches is a good height for filling 5 gallon buckets etc. it is also a good height because it allows easy cleaning of the top screen

■ Affix the rain barrel and overflow to the house. A full 50-gallon rain barrel weighs approximately 400 pounds and should be securely fastened to the home



*Raymond Thompson owns Sure Foot Builders Inc. and has been in Asheville for the past 10 years. He began as a helper over 20 years ago in Frankfort, Ken. and is now focused on building new green homes.*

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# Glossary

- **Advanced Framing:** Techniques that use less lumber, thereby reducing material cost and use of natural resources, and increasing the level of insulation as a result. Also known as Optimum Value Engineering (9).
- **Air Barrier:** A rigid material installed around a building frame to prevent or reduce the infiltration of air into the interior of a structure. An air barrier is installed as an energy-efficiency measure to maintain conditioned air inside the home and to improve the efficacy of insulation. Air barriers are not vapor barriers (1).
- **Air Infiltration:** Uncontrolled inward air leakage to conditioned spaces through unintentional openings in ceilings, floors and walls from unconditioned spaces or the outdoors. (2)
- **Batt Insulation:** The most common and widely available type of insulation. It comes in the form of pre-cut blankets or rolls and consists of flexible fibers, most commonly fiberglass, but is also available in cotton. It's held together with a binder. (10)
- **Building Envelope:** The exterior surface of a building's construction: the walls, windows, floors, roof and floor. Also called building shell. (2)
- **Daylighting:** The controlled admission of natural light into a space through glazing with the intent of reducing or eliminating electric lighting. Daylighting creates a stimulating and productive environment for building occupants. (2)
- **Energy Modeling:** Process to determine the energy use of a building based on software analysis. Can be used to provide a cost-benefit analysis for energy-efficient upgrades. (2)
- **Engineered Lumber:** Composite wood products made from lumber, fiber or veneer, and glue. These products can be environmentally preferable to dimensional lumber, as they allow the use of waste wood and small-diameter trees to produce structural building materials, but can also increase offgassing into the home. (2)
- **Fly Ash:** A fine, glass powder recovered from the gases of burning coal during the production of electricity. Fly ash can be used to replace a portion of cement in the concrete, providing some distinct quality advantages. (2)
- **Forest Stewardship Council (FSC):** A third-party certification organization, evaluating the sustainability of forest products. FSC-certified wood products have met specific criteria in areas such as forest management, labor conditions, and fair trade. (2)
- **Graywater Reuse:** A strategy for reducing wastewater outputs from a building by diverting the graywater into productive uses such as subsurface irrigation, or on-site treatment and use for nonpotable functions such as toilet flushing. Graywater includes water from bathtubs, showers, bathroom wash basins, and water from clothes-washer and laundry tubs. (2)
- **Greenguard:** Certification that a product meets emission thresholds for formaldehyde, total aldehydes, total volatile organic compounds (TVOCs), and one-tenth of the threshold limit value (TLV)—a regulatory standard—for many other compounds. The program also assesses emissions of other chemicals of concern. (7)
- **Green Label:** A certification program by the Carpet and Rug Institute for carpet and adhesives meeting specified criteria for release of volatile compounds. (2)
- **Green Roof:** Green roofs maintain living plants in a growing medium on top of a membrane and drainage system. Green roofs are considered a sustainable building strategy in that they have the capacity to reduce stormwater runoff from a site, moderate temperatures in and around the building, have thermal insulating properties, can provide habitat for wildlife and open space for humans, and provide other benefits. (2)
- **Green Seal:** A nonprofit that has certified products to an environmental standard since 1992. Green Seal now provides third-party certification for a wide range of products, including paints, adhesives, lamps, chillers, windows, cleaners, and occupancy sensors. (7)
- **Ground Source Heat Pump:** A heat pump that uses the ground temperature instead of air temperature to cool or heat a home. Usually this is accomplished with underground water pipes that transfer the ground temperature into the heat pump. (3)
- **Heating, Ventilation and Air Conditioning (HVAC):** General term for the heating, ventilation and air conditioning system in a building. System efficiency and design impact the overall energy performance of a home and its indoor environmental quality. (2)
- **Heat Recovery Ventilator:** An air-to-air heat

exchanger with balanced exhaust and supply fans that is an energy efficient way to meet necessary ventilation needs without producing drafts, or air pressure imbalance on a heating or cooling system. (2)

- **Hempcrete:** A biocomposite material of hemp and lime used for its low embodied energy and insulating qualities.

- **Indoor Air Quality (IAQ):** The nature of the air inside the space that affects the health and well-being of building occupants. IAQ is heavily influenced by both choice of building materials (and cleaning procedures) and ventilation rates. (1, 2)

- **Infill:** Developing on empty lots of land within an urban area rather than on new undeveloped land outside the city. Infill development helps prevent urban sprawl and can help with economic revitalization. (1)

- **Insulated Concrete Forms (ICF):** This wall structural system provides a strong and well-insulated wall system by using blocks fabricated from rigid insulation to create permanent forms for a poured concrete core. (3)

- **Kilowatt-hour (kWh):** A measure of energy equal to the amount of power multiplied by the amount of time the power is used. It is most often used to describe amounts of electrical energy. A 100-watt light bulb burning for 10 hours uses one kilowatt-hour of power. (3)

- **Load Calculation:** A heat-gain-and-loss calculation necessary to properly size the heating and cooling equipment to adequately and efficiently provide comfort and dehumidification for a particular building. Room by room load calculations should be performed, taking into account actual insulation levels, windows, building orientation, number of occupants, system location, air tightness, etc.

- **Low VOC:** See "Volatile Organic Compound" for more information. (2)

- **Mineral Wool Insulation:** An insulation product made of recycled slag or rock. It contains at least 70% recycled content, is moisture and fire resistance and comes most commonly in batts and rigid boards.

- **Minimum Efficiency Reporting Value (MERV):** A number from 1 to 16 that is relative to an air filter's efficiency. For the cleanest air, a user should select the highest MERV filter that their unit is capable of forcing air through based on the limit of the unit's fan power. (4)

- **Mixed-Use Development:** A development that includes diverse use types including elements of housing, retail, and office space. (1)

- **Net Metering:** A metering and billing arrangement that allows on-site energy generators to send excess electricity flows to the regional power grid. (2)

- **Passive Solar Homes:** Homes optimally designed to take advantage of the sun for heating in the winter and are shaded with an overhang, trellis, etc. in the summer and swing months. These homes have calculated amounts of thermal mass (concrete, tile, stone, etc.) and glass, insulation for the window "collectors", and their solar features are oriented to the south. A passive solar home is one in which the building itself is the solar collector and heat storage system. (3)

- **Payback Period:** The time estimated for a capital investment to pay for itself, calculated by relating the cost of the investment to the profit it will earn or savings it will incur. (1)

- **Performance Contracting:** A contracting service that provides customers with a comprehensive set of energy efficiency, renewable energy and distributed generation measures and often comes with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project. (11)

- **Photovoltaics (PVs):** Solid-state cells (typically made from silicon) that directly convert sunlight into electricity. (1)

- **R-value:** A unit of thermal resistance used for comparing insulating values of different materials; the higher the R-value, the greater it's insulating properties. (2)

- **Radiant Barrier:** A material (typically an aluminum foil) that is good at blocking the transfer of radiant heat across a space because it has a low emissivity. In a hot climate, it is often installed in attics under the roof decking to keep the attic cooler. (1)

- **Radon:** A colorless, naturally occurring, radioactive, inert gas formed by radioactive decay of radium atoms in soil or rocks. When trapped in buildings, concentrations build up, and can cause health hazards. (1, 2)

- **Rain Garden (Bioretention):** A landscape feature that incorporates deep porous soils and specially designed plantings to gather, store, and treat stormwater. (3)

- **Rainwater Catchment/Harvest:** On-site rainwater harvest and storage systems used to offset potable water needs for a building



## How to air seal in hard to reach spots

If you have to air seal in a place that you can't easily reach you can use a piece of 5/16" OD - 3/16" ID clear vinyl tubing, a piece of insulation hanger wire, and a can of Great Stuff. Slide the vinyl tubing over the nozzle attached to the can of Great Stuff. Tape the loose end of the vinyl tubing to one end of a 24" insulation hanger wire (or stick of some sort) and you can hold the can in one hand and guide your foam with the other hand as you air seal that hard to reach spot.

— Raymond Thompson, Sure Foot Builders



and/or landscape (2)

- **Rapidly Renewable Materials:** Material that is considered to be an agricultural product that takes 10 years or less to grow or raise and to harvest in an ongoing and sustainable fashion. Examples include bamboo flooring, biocomposite veneers, fiber-based finishes, wool and cotton insulation. (2, 3)
- **Retrofit:** The replacement, upgrade, or improvement of a piece of equipment or structure in an existing building or facility. (1)
- **Salvage:** Building materials diverted from the waste stream intended for reuse. Commonly salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick and decorative items. (2)
- **Scientific Certification Systems (SCS):** A third-party assessment body that offers evaluation and certification services to a broad range of manufacturing sectors. Their Eco Product Certifications include: Environmentally Preferable Products, Sustainable Choice, four Indoor Air Quality Certifications and Material Content. (8)
- **Seasonal Energy Efficiency Ratio (SEER):** The measure of the energy efficiency for air conditioners and the cooling side of heat pumps. The higher this number, the better, with code being 14 SEER. (1)
- **Solar Electric Systems:** Electricity producing systems that directly convert the sun's energy into electricity. Photovoltaic systems consist of solar panels, an inverter and controller, and are either off grid or grid tied. (1)
- **Solar Heat Gain Coefficient (SHGC):** The fraction of solar radiation admitted through a window or screen, both directly transmitted and absorbed, and subsequently released into the living space. (1)
- **Solar Thermal Systems:** Energy producing systems that gather the sun's radiant energy to heat air or water for use as domestic hot water or space heating.
- **Spray Foam Insulation:** The insulation is applied as a liquid is sprayed through a nozzle into wall, ceiling, and floor cavities where it expands to fill every nook and cranny. Spray foam insulation makes it easy to completely fill wall cavities with insulation and to perform air sealing in the same step. (9)
- **Stormwater Management:** To protect the local ecology and hydrology, limit and control stormwater runoff by providing for on-site storage and filtration. Pervious pavement systems, reduced amounts of impervious pavement (concrete, asphalt), rainwater collection, green roofs, rain gardens (bioretention) and constructed wetlands are methods to accomplish this. (3)
- **Straw-Bale Construction:** Alternative build-

ing method using bales of straw for wall systems in place of standard construction materials. (2)

- **Structural Insulated Panel (SIP):** Manufactured panels consisting of a sandwich of polystyrene between two layers of engineered wood paneling. SIPs can be used for walls, roof or flooring, and result in a structure very resistant to air infiltration. (2)
- **Thermal Mass:** A mass (often stone, tile, concrete or brick) used to store heat and reduce temperature fluctuation in a space by releasing heat slowly over time. Used in passive solar design. (2, 3)
- **Universal Design:** The design of products and environments that are usable by all people, regardless of age or physical ability, to the greatest extent possible, without adaptation or specialized design. (6)
- **Volatile Organic Compound (VOC):** Carbon compounds that become a gas at normal room temperatures. This class of chemical compounds can cause nausea, tremors, headaches, and some doctors believe, long-lasting harm. VOCs can be emitted by oil-based paints, solvent-based finishes, formaldehyde-laden products and other products on or in construction materials. (2, 3)
- **WaterSense:** Modeled after Energy Star, the EPA's new water efficiency program seeks to educate consumers about water efficiency through an easily identifiable logo. Products include fixtures, faucets, showerheads, irrigation systems and toilets. WaterSense differs from Energy Star in that a product's conformance to EPA standards must be independently tested before qualifying for the label. (7)
- **Wind Power:** Systems that convert air movement into mechanical or electrical energy. Driven by the wind, turbine blades turn a generator or power a mechanical pump. Wind generators include a tower and wind turbine, and can be off-grid or grid-tied. (2, 3)
- **Xeriscaping:** Landscaping design for conserving water that uses drought-resistant or drought-tolerant plants. (2)

Sources:

- (1) Sourcebook Glossary, [www.austineenergy.com](http://www.austineenergy.com)
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- (11) [www.energystar.gov](http://www.energystar.gov)



## Cooking with Science: Induction cooktops

Induction cooktops look the same as a glass-top electric range, but they work very differently. Induction cooktops have several big advantages for green homes:

- The cooktop works by heating the pot, not the burner, so it transfers heat more efficiently to the food, cooking it faster and with less indoor heat buildup in the summer.
  - Since the cooktop only gets warm because the pot is sitting on it, spills don't burn onto the surface and it's much easier to clean.
  - Since burn-off from traditional electric stoves (or gas flames) is an indoor air quality concern, induction cooktops reduce this source of indoor air contaminants.
  - Induction cooking is fast and instantly controllable. Water boils in a minute or two and the heat turns down as quickly as a gas flame. It's actually more controllable than a gas flame because the numbered controls help you learn the precise settings for boiling, simmering, and other frequent tasks.
  - For high-end kitchens, induction offers attractive design options, without the need for an over-sized kitchen range hood. Over-sized kitchen hoods (often paired with commercial gas ranges) require expensive and inefficient makeup air to prevent tight homes from depressurizing.
  - In a net-zero home, it often doesn't make financial sense to have multiple energy sources. Induction cooking offers a highly functional way to cook in an all-electric home.
- Induction cooktops work by using an alternating electric current in a copper coil inside the cooktop to "induce" an electric current in the pot. This requires that cast iron or stainless steel cookware be used. The pot itself heats the food. Induction cooktops are fast becoming preferred by chefs and homeowners alike, with environmentally-conscious consumers as early adopters.

— By Amy Musser, Vandemusser Design

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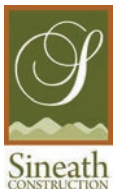


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**ECO - Environmental & Conservation Organization**  
Mary Jo Padgett  
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## Engineers

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VandeMusser Design provides technical consulting and certification services for green residential construction to builders, architects, developers, and homeowners in WNC, TN, VA, SC and GA. Our company is run by an architect and engineer with extensive experience. We are here to assist with the technical aspects of green building, regardless of whether you are renovating, designing or certifying a home.

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## Finishes - Interior



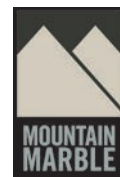
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VandeMusser Design provides technical consulting and certification services for green residential construction to builders, architects, developers, and homeowners in WNC, TN, VA, SC and GA. Our company is run by an architect and engineer with extensive experience. We are here to assist with the technical aspects of green building, regardless of whether you are renovating, designing or certifying a home.

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### Jerald A. Snow,

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Jerald Snow

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## Realtors



**Amanda Boren - Town & Mountain Realty**  
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828.713.7049

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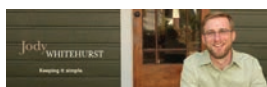
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Jody Whitehurst, Realtor  
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[Mike@mymosaicrealty.com](mailto:Mike@mymosaicrealty.com)

At Mosaic Community Real Estate, we specialize in green real estate and in-town properties. Our approach to real estate is to advance the interests of our clients by being attentive to their needs and to negotiate aggressively on their behalf. Real estate is our job and passion. Call or email for a free consultation over coffee or tea.



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Robbie McLucas, Realtor  
828.335.2515

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[www.townandmountain.com/robbie@townandmountain.com](http://www.townandmountain.com/robbie@townandmountain.com)  
As a real estate broker at Town & Mountain Realty, Robbie focuses primarily on Asheville's core neighborhoods. He provides clients with specialized services and an in-depth knowledge of this city's vibrant communities. Additionally, Robbie works as the listing agent for several of Asheville's most successful green builders.

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[ssstetson@ashevillehabitat.org](mailto:ssstetson@ashevillehabitat.org)  
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Candler, North Carolina 28715  
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[harshul@rgees.com](mailto:harshul@rgees.com)



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Fairview, North Carolina 28730  
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[info@sugarhollowsolar.com](mailto:info@sugarhollowsolar.com)  
With a combined 42 years experience in the solar and radiant heating industries, Sugar Hollow Solar strives to provide high quality design and installation services. Our office and shop is located just outside of Asheville in Fairview, NC.



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[www.sundancepower.com](http://www.sundancepower.com)  
[info@sundancepower.com](mailto:info@sundancepower.com)  
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**Thermacraft Solar Solutions, Inc.**  
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PO Box 15370  
Asheville, North Carolina 28813  
[www.a-b-construction.com](http://www.a-b-construction.com)  
[jeremybonner@a-b-construction.com](mailto:jeremybonner@a-b-construction.com)  
A&B has been in business for over 30 years doing new construction and renovation for both residential home owners and commercial clients within a 50 mile radius of Asheville NC.



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[www.buildwellinc.com](http://www.buildwellinc.com)  
[buildwell@gmail.com](mailto:buildwell@gmail.com)

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www.ecologicaldesign.net  
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### Southeast Ecological Design

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Asheville, North Carolina 28803  
www.ashevillehabitat.org  
sstetson@ashevillehabitat.org

The Asheville Habitat ReStore sells donated items to the general public, with proceeds supporting Habitat's building programs. Find building supplies, appliances, furniture and much more. The removal of usable materials from structures is available through their Deconstruction service.

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www.livingroofsinc.com  
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### Asheville Area Habitat for Humanity Restore

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828.210.9376  
30 Meadow Road  
Asheville, North Carolina 28803  
www.ashevillehabitat.org  
sstetson@ashevillehabitat.org

The Asheville Habitat ReStore sells donated items to the general public, with proceeds supporting Habitat's building programs. Find building supplies, appliances, furniture and much more. The removal of usable materials from structures is available through their Deconstruction service.



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828.524.7958  
874 Lotia Church Road  
Franklin, North Carolina 28734  
www.libertywoodproducts.net  
don@libertywoodproducts.net



**Smoky Mountain Log Homes**  
George Blackburn  
828.734.7151  
3517 Jonathan Creek Road  
Waynesville, North Carolina 28785  
www.smokymtnhomes.com  
george@smokymtnhomes.com



**Whole Log Lumber**  
Jim Stowell  
828.697.0357  
195 Blueberry Farm Road  
Zirconia, North Carolina 28790  
www.wholeloglumber.com  
info@wholeloglumber.com  
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## System-Built Homes



**Deltec Homes**  
Leigha Dickens  
828.253.0483  
69 Bingham Road  
Asheville, North Carolina 28806  
www.deltechomes.com  
ldickens@deltechomes.com

We have produced energy-efficient, round homes for more than 40 years. Our homes are paneled in a controlled setting and provide a low-waste, high-performance structure.



**Heirloom Timber Framing**  
Ford Hall  
828.837.8039  
248 Settawig Road  
Brasstown, North Carolina 28902  
www.HeirloomTimberFraming.com  
greetings@heirloomtimberframing.com  
Heirloom Timber Framing is a design build company specializing in the building art of timber frame homes, commercial buildings and specialty structures. We utilize mortise-tenon style joinery to build exquisite post and beam structures.



**Mountain Brook Homes Inc**  
J.D Wallace  
828.250.0004  
31 College Place B-121  
Asheville, North Carolina 28801  
www.mountainbrookhomesinc.com  
jd@mountainbrookhomesinc.com

## Wall System Installers



**High Country Timberframe & Gallery Woodworking Co.**  
Tom Owens  
828.264.8971  
PO Box 1858  
Boone, North Carolina 28607  
www.highcountrytimberframe.com  
tomo@highcountrytimberframe.com  
High Country Timberframe & Gallery Woodworking Co. has been a leader in traditional and contemporary timber frame and SIPs panel design and construction for over 12 years with projects completed throughout the Eastern United States. With many high profile projects in their resume, High Country Timberframe & Gallery Woodworking Co. strives to ensure that the second life of the tree be as dignified as the first.



**Superior Walls of NC**  
Bob Bauer  
828.606.8371  
5045 Hendersonville Road  
Fletcher, North Carolina 28732  
www.superiorwallsnc.com  
bbauer@superiorwallsnc.com

## Water Conservation & Purification

**Aqua Pro by Little Green Frog**  
Jason Rector  
828.768.3962  
PO Box 1947  
Asheville, North Carolina 28802  
www.aquaprolosolutions.com  
jason@aquaprolosolutions.com

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Older showerheads can use 3 gallons per minute or more.  
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## Waterproofing



**J. Coleman Waterproofing**  
Jan Coleman  
828.299.8506  
505 Lafayette Ave  
Asheville, North Carolina 28805  
www.jcolemanwaterproofing.com  
jan@colemanwaterproofing.com  
Below grade waterproofing Tuff-N-Dri R3,5,10 or any combo. Slab on grade to seal plate R5-10 Air Moisture Barriers EnviroDri. Encapsulated crawlspaces. Interior Drains.  
www.jcolemanwaterproofing.com

## Windows and Doors



**Architectural Woodcraft Inc.**  
Craig Weis  
828.258.9977  
199 Amboy Road  
Asheville, North Carolina 28806  
www.architecturalwoodcraft.com  
craig@architecturalwoodcraft.com  
Locally made cabinets, doors, and energy star windows. Implementing green finishes and Bamboo sustainable and reclaimed woods. Restoration specialists.

**Celestial Windows & Doors, LLC**  
Paul Hunt  
828.808.1424  
PO Box 1852  
Flat Rock, North Carolina 28731  
www.paulhunt.com  
paulhuntNC@aol.com



**Jennings Builders Supply & Hardware of Brevard**  
Dick Jennings  
828.884.9663  
2196 Asheville Highway  
Brevard, North Carolina 28712  
www.jenningswnc.com  
info@jenningswnc.com  
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## Woodworkers and Cabinetry



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199 Amboy Road  
Asheville, North Carolina 28806  
www.architecturalwoodcraft.com  
craig@architecturalwoodcraft.com  
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**BuiltSmart by bob**  
Bob Callahan  
828.620.9730  
104 Lakeshore Drive  
Asheville, North Carolina 28804  
www.BuiltSmartbybob.com  
casegreenbob@gmail.com  
BuiltSmart by bob: hands-on craftsmanship and smart implementation of building science so that your next home will be dramatically more energy efficient and alternative energy ready (HERS less than or equal to 55) with superior interior air quality and comfort. Also offering renovations and our modern, European-style, frameless cabinets, CaseGreen, cost competitive cabinets with sustainable materials.



**Columbia Forest Products**  
Richard Poindexter, LEED AP  
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7900 Triad Center Drive  
Greensboro, North Carolina 27409  
www.columbiaforestproducts.com  
rpoindexter@cfpwood.com  
North America's largest manufacturer of decorative hardwood veneer and hardwood plywood (including plant in Old Fort, NC). Panels used for all types of interior casework (commercial and residential). FSC Certified. CARB & LEED Compliant. Innovator of soy-based formaldehyde free PureBond technology.



**Faulkner Woodworking and Construction, LLC**  
Chris Faulkner  
828.577.5493  
61 King Street  
Brevard, North Carolina 28712  
www.faulknerwoodworking.com  
faulknerwoodworking@gmail.com  
Full service woodshop and craftsman homebuilder in Brevard, NC. Our focus is on quality and tasteful construction no matter the scope of work. Services include new home construction, timberframing, cabinetry, furniture and remodeling.



**HomeSource Design Center**  
Tim Alexander  
828.252.1022  
172 Charlotte Street  
Asheville, North Carolina 28801  
www.the-homesource.com  
tim@the-homesource.com  
One convenient location providing home improvement, new construction and remodeling products; kitchen and bath design; and all your construction needs both inside and out. Specializing in Cabinets, Countertops, Hardwood Flooring, Tile, Closet Systems, Stone, Cabinet & Bath Hardware & Window Treatments. Visit our showroom to view samples, make selections or speak with one of our kitchen and bath designers.



**Ironwood Studios LLC**  
Thomas Gibson  
828.501.6954  
329 Emma Road  
Asheville, North Carolina 28806  
www.ironwoodcustomcabinetry.com  
tom@ironwoodstudios.org

**Revolution Design Works**  
Joe Archibald  
828.273.9509  
54 N. Liberty Street, Unit 1  
Asheville, North Carolina 28801  
www.revolutiondesignworks.com  
joe@revolutiondesignworks.com



**Sage Builders**  
Doug Keefer  
828.713.7208  
299 Morgan Branch Road  
Leicester, North Carolina 28748  
www.thesagebuilders.com  
info@thesagebuilders.com  
SAGE Builders focuses on Sustainable, Appropriate, Green, and Efficient building techniques; specializes in solar designs and custom woodworking; and works with natural materials to create beautifully hand-crafted homes with passive and active solar amenities.



For info on events, educational opportunities and resources visit  
[www.wncgb.org](http://www.wncgb.org)



# How does your home measure up?

**Putting your home on the market?** Let buyers know how green your home is in a simple and easy to read format by providing them with a Green Gauge Assessment

**Interested in remodeling and don't know where to start?** Have an assessment done by an experienced professional and take advantage of incentives to save energy!

**Buying a home?** Ask for a Green Gauge Assessment and compare.

## Sample Assessment



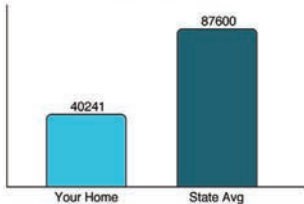
### Green Gauge Assessment

Homeowner Name 2 Greenest dr, Asheville, NC 28811  
828-555-5555 Built in 2013  
4 bedrooms 1899 square feet  
Green Built Platinum, LEED Platinum, NGBS Emerald, ENERGY STAR v.3.0, NC HERO Code

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#### Water Use

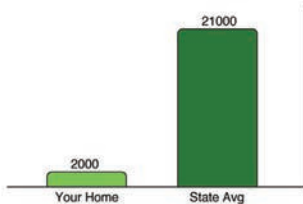
Estimated Annual Indoor Water Use (in gallons)



Category	Value (gallons)
Your Home	40241
State Avg	87600

#### Energy Use

Annual Energy Use (in kWh)



Category	Value (kWh)
Your Home	2000
State Avg	21000

---

#### Green Building Materials

Roofing: Lifetime Warranty Asphalt & Green roof  
Counters: Bamboo & Quartz, solid gold  
Siding: Recycled/Reclaimed & Hardi  
Decking: Locust  
Cabinets: Made of old metal siding

#### Energy and Water Efficiency

Shower Heads: 1.25 GPM  
Sink Faucet Aerators: 0.35 GPM  
Toilets: 1.00 GPF  
Washing machine is Energy Star labeled

---

#### Indoor Air Quality

CO Detector Present  
ASHRAE Compliant Ventilation System: Erv / Hrv  
Bath Fan Exhausts to Outside  
Kitchen Rangehood Exhausts to the Outside  
Radon System: Active  
High efficiency air filter: Merv 8 or greater  
Sealed crawlspace

#### Site & Outdoors

Turf Grass: None  
Natives and Edibles: Over 50% of Landscape  
Rain Catchment: +500 Gallons  
Notable Features:  
Fruit Trees, Permeable Driveways, Rain Garden, Vegetable Garden, Xeriscaping, Drought Resistant Ground Cover, Designed Permaculture, Wetland, Meadow/native Non-turf Grasses, Mature Trees Or Forest, South Facing Roof For Future Solar, Frog Pond

828.254.1995

A program of the Western North Carolina Green Building Council  
www.WNCGBC.org

Info@WNCGBC.org



A low-cost, simple program to help you gauge your:

- Energy use
- Landscaping
- Indoor water use
- Walkability
- Environmentally-preferable materials



Green Gauge is a program of the WNC Green Building Council [www.wncgbc.org](http://www.wncgbc.org)



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