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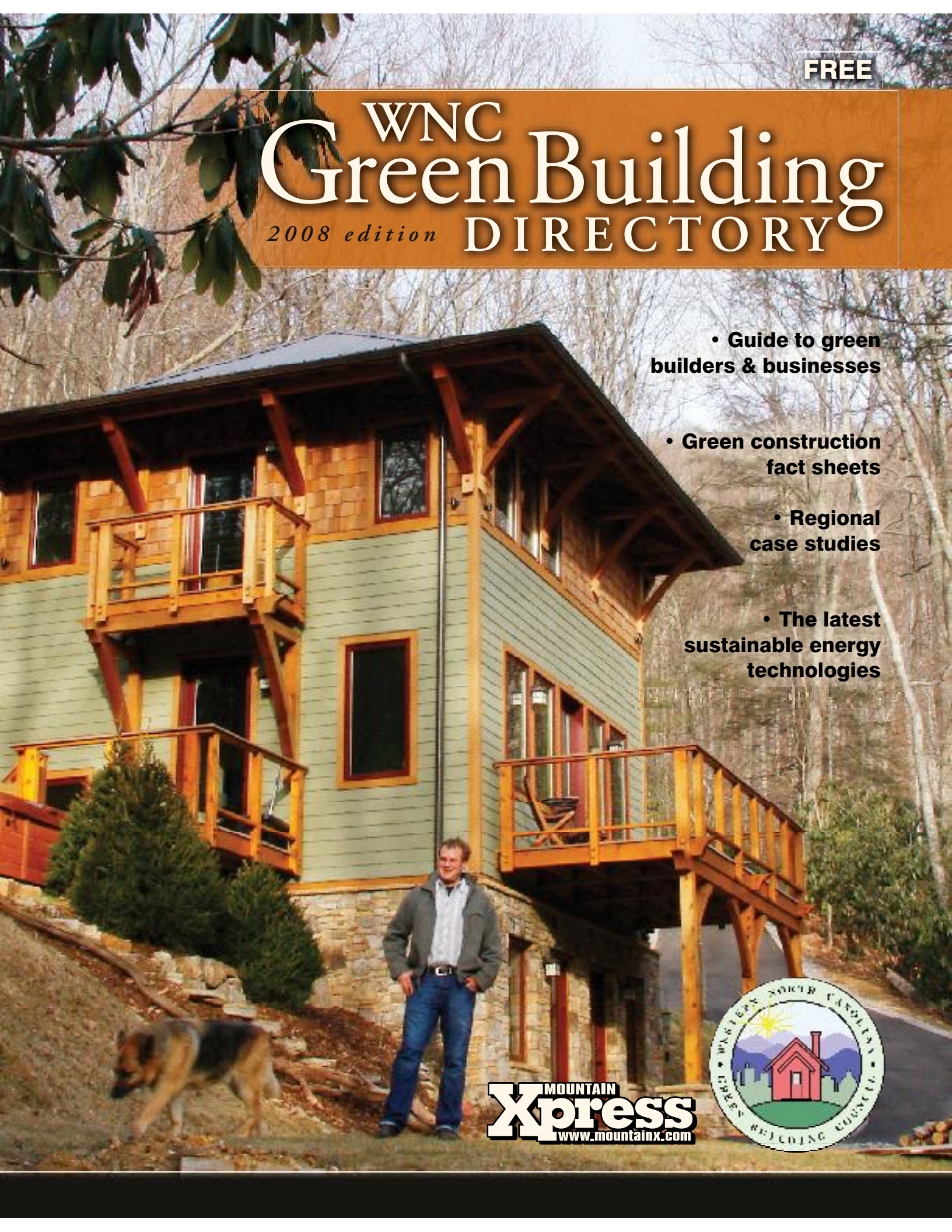
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eliminating the need for an additional layer of flooring.

Here are a couple of definitions to guide you in choosing recycled materials. Post-consumer recycled content means utilizing a waste material that can no longer be used for its originally intended purpose. An example of that might be a carpet made out of old soda bottles. Pre-consumer or post-industrial recycled materials are made from waste products that were diverted during the manufacturing process.

I've been wondering: What's so green about cork and bamboo?

These materials grow back quickly after being harvested, 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. The downside, though, is that both have to be shipped from across the world.

Any bright ideas for reducing energy consumption?

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. Examples are low-flow fixtures that save water, or insulation and light bulbs that reduce the energy needs of a building. Once you have reduced the overall energy and water you're using, consider renewable-energy equipment that actually produces energy, such as photovoltaic panels.

The Department of Energy certifies the most energy-efficient products. Visit www.energystar.gov to learn which appliances,

heating and cooling equipment, lighting, roofing products, windows and doors offer the greatest energy savings, or just look for the Energy Star logo. There are also a number of steps you can take, free of charge, to conserve energy. Visit the Department of Energy's Energy Savers site (www1.eere.energy.gov/consumer/tips) for advice, or check out the in-depth information provided by the Rocky Mountain Institute Home Energy Briefs (www.rmi.org/sitepages/pid119.php).

I love the way finished wood looks inside my home, but I really don't think a forest should be destroyed just so I can buy lumber. How can I find wood products that are gentle on the environment?

Some lumber has been third-party certified as having been harvested with sustainable forestry practices. You will definitely pay a premium for certified lumber, but you can rest assured that the trees in your home were replaced and managed very carefully. Look for Forest Stewardship Council (www.fsc.org) certified wood. And, as stated earlier, don't forget about the option of using recycled or reclaimed wood products.

I've heard that many products contain harmful chemical additives, or give off volatile organic compounds that pose a health risk. What steps can I take toward a nontoxic home?

Minimally processed materials typically have less of the chemical additives that can impact your health. For instance, formaldehyde is common in many engineered products (which tend to be considered green because they are stronger and use fewer resources) because

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Cindy Patton, who heads up earth-friendly building supply store Shelter Ecology, chose reclaimed wood for this corridor in her home.

photo courtesy of Cindy Patton

it acts as a binding agent. There are increasing efforts to replace formaldehyde with less-toxic binding agents. Cabinet-grade, formaldehyde-free plywood, for instance, is manufactured locally in Old Fort by Columbia Forest Products.

Natural and low-toxic materials also have fewer chemical additives, from manufacturing to end-use.

Almost every chemically based product, from paints to adhesives, is now available in a low-VOC (volatile organic compound) version. Green Seal (www.greenseal.org) is an independent nonprofit that promotes the use of environmentally friendly materials, using a certification system for paints, cleaners and other products. Also, check out Scientific Certification Systems (www.sccertified.com), which certifies adhesives, sealants, cabinetry, doors, carpet, flooring and paint.

I'm thinking long-term. I don't want the products I'm purchasing today to end up in

the landfill, even after they've lived out their use many years from now. Is there any way to put this ideal into practice?

A great way to understand the true impact of a product is to look at it in terms of a life-cycle assessment, which analyzes the product from resource extraction, through production, to use and finally disposal. A design concept called "cradle to cradle," introduced by architect William McDonough, takes into account the entire life cycle of materials. Rather than becoming waste after they've lived out their use, cradle-to-cradle products are returned to industrial cycles for use as raw materials for new products. Or, in the case of biodegradable materials, they'll decompose naturally without any adverse environmental impacts. There is actually a certification program for such products. Visit <http://c2ccertified.com> for a list of building exteriors, floor coverings, surface coatings and other certified cradle-to-cradle materials.

Green building has to include an element of social justice, too! How do I find materials that support people as well as the planet?

Many green materials only fulfill the environmental tenet of sustainability, but true sustainability addresses social and economic impacts. Purchasing products that are produced by companies that pay workers a fair wage, or that are made locally, can lead our own community to a brighter future. Plus, locally produced products help reduce greenhouse-gas emissions by reducing the transportation impacts. You can't buy everything locally, but you can choose products that are making a positive impact somewhere, as in the case of fair-trade products that are helping to create social equity in developing countries. Many companies are now purchasing carbon offsets or renewable-energy credits, claiming that their products are produced with 100 percent renewable energy. This sounds great, but make sure their claims are legitimate and that they are working to minimize their impact, as well as offset it. ■■■

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More resources:

- *Cradle to Cradle: Remaking the Way We Make Things* by William McDonough and Michael Braungart (North Point Press, 2002)
- Life Cycle Assessment: <http://www.epa.gov/nrmrl/lcaccess/>
- EPA statistics on buildings and the environment: <http://epa.gov/greenbuilding/pubs/gbstats.pdf>
- www.BuildingGreen.com
- www.GreenHomeGuide.com
- www.TheGreenGuide.com

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Tom Rioux, CEO of Earthpaint, says he has his son Emerson in mind when he's formulating safe, nontoxic paints. Here they are at The Healthy House, a new green-products store in Fletcher.
photo by Jonathan Welch



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Greenspec® product standards at a glance

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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

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- Equipment that conserves energy
- Renewable energy
- Fixtures and equipment that conserve water

Products that contribute to a safe, healthy indoor environment

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Case study: Zero-energy home

» ASU and Habitat for Humanity combine efficiency and affordability
by Rebecca Bowe

Wouldn't it be nice if the power company sent you a check every month?

Duke Energy actually does send Hickory resident Frances Thompson a partial reimbursement for her monthly bill. Thompson's house has a solar-photovoltaic array on its rooftop. Because the solar-electric system is tied in with the power grid, Duke pays her 5 cents per kilowatt-hour for the electricity generated, while she pays the utility 8 cents per kwh, like any other consumer, for using the traditional power. Thanks to NC GreenPower, a statewide nonprofit dedicated to promoting clean energy, her grid-tied solar house amounts to a sweet deal: NC GreenPower sends Thompson an additional monthly check at a rate of 18 cents per kwh for using clean energy.

"Even during the hot snap, around July, she still came out a couple bucks ahead," notes Rob Howard, who oversaw the construction of Thompson's home. The house was built in 2005 by Habitat for Humanity of Catawba Valley, with the help of the Appalachian State University Energy Center. It was designed to be a "zero-energy home": a house that consumes roughly as much energy as it produces. Thompson, like all Habitat for Humanity home recipients, was selected after an application process demonstrating her need for affordable housing and ability to keep up with a low-end, no-interest mortgage. Thompson is battling medical issues that make it difficult for her to work full time, so low housing payments and low utility bills are a major help, she says.

The project combined expertise from ASU, grant money from the N.C. State Energy Office, the services of affordable-housing nonprofit Advanced Energy, generous donations from renewable-energy and green-building companies and the hard work of some 100 Habitat for Humanity volunteers. The result? An innovative dwelling that stands as proof of what can be achieved when the twin ideals of affordability and energy efficiency are combined.



Rob Howard, construction project manager for Catawba Valley Habitat for Humanity, oversaw the construction of this zero-energy home in Hickory.
photo by Jonathan Welch

The zero-energy home might be easy to miss if it weren't for the rooftop photovoltaic panels. At a modest 1,200 square feet, with three bedrooms and two baths, the house is designed to blend in with the bungalow-style residences in its suburban Hickory ■►

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For every house is built by someone, but God is the builder of everything. **The Bible, Book of Hebrews**

neighborhood, and like the other homes, it fits snugly into a tiny lot.

But the sunny little bungalow is anything but average. The heating and cooling system, for instance, is fueled by a geothermal system donated by WaterFurnace. Depending on the season, the system is supposed to circulate warm or cool air from underground to the interior of the house, taking advantage of constant subterranean temperatures.

Solahart, a solar-technology manufacturing company, donated a solar water heater for the project, which consists of a pair of solar panels and a tank mounted on the roof.

The design of the house, meanwhile, is meant to take full advantage of the sun's energy. A row of windows in the south-facing living room allow for sunlight to stream in fully during the winter. The sun's rays are absorbed by an insulated concrete slab overlaid with recycled tiles, which naturally lets off heat as a supplementary heating system.

Energy efficiency was the deciding factor behind many aspects of the design, from insulation to lighting systems. Icynene, a type of foam insulation that seals off every nook and cranny for an optimally airtight building envelope, was used in the exterior walls.

The home is certified gold by the N.C. HealthyBuilt Homes program, and ASU continues to monitor its performance.

The project demonstrates what is possible when resources are combined with high ideals and green design. Still, it's not perfect:

Thompson says that it is often uncomfortably hot in her home, a signal that the carefully planned heating system is working over time.

Nor can this affordable green model be realistically implemented on a mass scale — at least not yet. Catawba County recently suffered major job losses, and Howard says his Habitat for Humanity chapter is having a difficult time finding home recipients who would be able to keep up with the inexpensive, no-interest mortgage payments that the nonprofit offers to low-income families. For many, simple home ownership — let alone a green home — remains out of reach. A substantial grant from the State Energy Office provided for the solar array on the Hickory zero-energy house, but in most cases, solar is out of the question due to cost. "The big key is going to be reducing the price of photovoltaics," notes Howard. "It's going to take something creative to reach the masses." ■

Rebecca Bowe is contributing editor at Mountain Xpress, and writes a weekly environmental news column for the newspaper called "Green Scene." She can be reached at rbowe@mountainx.com or at (828) 251-1333, ext. 154.



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relocate, and they intended to make their new Asheville home as energy-efficient and environmentally sustainable as possible.

But the renovation project soon became more complicated than anyone had anticipated. The earthen basement crawlspace had developed a moisture problem due to poor drainage. Meanwhile, the Corwins had to scrap their initial plans to go solar and to use a geothermal heating system, due to practical feasibility and cost. The home's eccentric layout had to be dealt with too, so they hired architect John Legerton to assist with an interior redesign.

Despite the bumps in the road, the Corwins are satisfied with their decision to renovate rather than build. "Way back, we learned that the greenest thing you can do is to not build a new house," says Stan. With this renovation, notes

Demos, they didn't add any more to the building footprint that already exists, nor did they create any new erosion or runoff problems.

Demos initiated a plan to improve the drainage pathway, and worked with Home Energy Partners to seal up the crawlspace to make it airtight and dry. Since the interior had to be gutted, they decided to use Icynene foam insulation in the exterior walls for a tighter seal all around.

Tight insulation for greater efficiency is just the beginning of what sets this residence apart. With the help of plumber Georg Efrid, the renovation team installed a gray-water system, which cycles wastewater from the showers, sinks and laundry to the toilets — a very effective way to conserve. The system was the first of its kind to be installed in Asheville. (Efrid later led a seminar to bring city and county inspectors up to speed on gray-water systems.)

Case study: Utopian renovation

» Newcomers choose natural renovation

by Rebecca Bowe

It started out as a cabin built in 1925. Over the years, several layers of additions were made to the house on Utopia Road in Asheville, and the hemlocks lining the side yard grew tall enough to shade the two-story abode. But by the time Florida residents Stan and Colette Corwin closed on it in March 2007 and builder Jim Demos began assessing it for renovations, the old house needed some love.

Problem solving may be central to any renovation, but revamping an old house to be as gentle on the environment as possible can be especially challenging. The Florida couple had been living in a green home in a rural area outside Fort Myers before deciding to

Stan and Colette Corwin, who dream of a summertime garden at their newly refurbished green Asheville residence.
photo by Jonathan Welch

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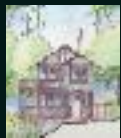


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installed low-flow showerheads, low-flush toilets, an on-demand hot-water system, energy-efficient lighting, high-efficiency windows, a high-efficiency heat pump and a woodburning stove that takes care of 75 percent of their heating needs. For optimal air circulation during the heat of summer, Demos built a cupola with an electric remote to open and close the windows.

The renovation team was able to reuse much of the lumber that was stripped out, so when it came to buying new lumber for the flooring and deck, the Corwins set out in search of the most eco-friendly material available. They settled on recycled-pallet flooring, as well as wormy red oak and cypress that had been reclaimed from a river bottom — left over from an era when the timber industry floated logs down the river to be milled. “The idea of cutting down trees so that we can have a nice deck is abhorrent to us,” notes Stan. For the bathroom floors, they used cork, which is considered green because the trees don’t need to be felled to harvest it.




Builder Jim Demos, who conducted the green renovation, surveys Icynene that has been recently applied. The foam insulation renders the home much more energy efficient. *photo by Jonathan Welch*


The kitchen at the Corwins’ home also reflects their green principles. In addition to cabinets built from wood that is certified by the Forest Stewardship Council — and therefore harvested with sustainable practices — the couple selected countertop material made from a combination of river stone and fly ash from power-plant scrubbers, a waste material.

“We were glad we were able to restore it, do it right, and make it sustainable,” says Colette. The couple is now looking forward to moving in — and starting an organic garden in the backyard. ■

Rebecca Bowe is contributing editor at Mountain Xpress, and writes a weekly environmental news column for the newspaper called “Green Scene.” She can be reached at rbowe@mountainx.com or at (828) 251-1333, ext. 154.



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Builder Jim Demos, who conducted the green renovation, surveys Icynene that has been recently applied. The foam insulation renders the home much more energy efficient. *photo by Jonathan Welch*



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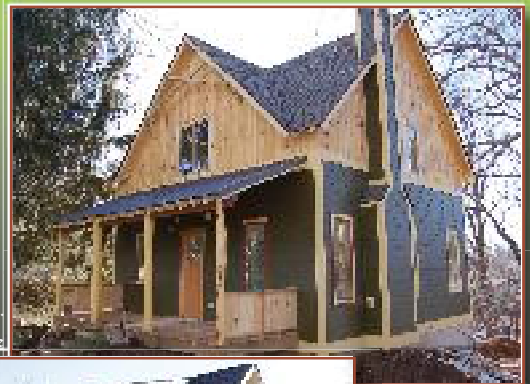
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Case study: UNCA making strides toward sustainability

» Sam Millar Complex a model for
green design

by Rebecca Bowe



Tony Kapustka, HVAC mechanic at UNCA, says the building's solar and geothermal heating-and-cooling system is really quite simple.

photo by Jonathan Welch

The facilities complex that once housed the University of North Carolina Asheville's maintenance workers, groundskeepers, plumbers, electricians and other operations staff members was cramped, outdated and generally inefficient. But the new campus facilities hub now standing in its place has an emphasis on efficiency that places it on par with the most environmentally sensitive buildings in the region. Completed in September 2007, the 27,660-square-foot Sam Millar Facilities Management Complex is an outstanding local example of green design, as well as a tribute to the memory of a longtime employee.

Named for Sam Millar, a native of Ireland who served as university engineer for 15 years, this new operations building was designed with people's health and the environment in mind. With cutting-edge green technology such as a geothermal heat-pump system, a solar-thermal array and a sophisticated stormwater filtration system in place, UNCA is pursuing a silver certification for the building from Leadership in Energy and Environmental Design, a national and prestigious certification program.

While most buildings have a "boiler room" to house the heating-and-cooling system, the Sam Millar Complex equivalent doesn't have a boiler as its centerpiece. Instead of electricity or gas, it relies upon a combination geothermal/solar system for heating and cooling needs. The geothermal system continuously circulates water through a system of 12 pipes bored 450 feet into the ground, taking advantage of the earth's constant 55-degree temperature to provide warmth in the winter and relief from the heat in the summer. Meanwhile, a rooftop array of solar panels provides solar-heated water for the buildings' sinks, while supplementing the indoor

A large advertisement for City Real Estate. The background is a close-up, artistic photograph of a person's face, possibly a woman, with a pencil held near their mouth. The text is overlaid on the image. In the top left, it says "A True Original" in large, bold letters. Below that, in a yellow circular graphic, is the "City Real Estate" logo and the name "DEVORAH THOMAS Broker/Owner". Underneath the circle, it lists "Sales and Property Management", the website "www.AshevilleCityRealEstate.com", and phone numbers: "(828) 210-2222 (office)" and "(828) 776-5384 (cell)". At the bottom of the circle, it says "Located in historic Montford".

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heat during the winter through a heat exchanger.

"This is our power plant, let's say," says HVAC mechanic Tony Kapustka as he gestures upward to a towering, 1,000-gallon hot water tank and a complicated network of pipes winding through the ceiling of the basement-level "heat-pump room." A digital reader mounted on the tank shows that the solar panels have heated the water to 120 degrees Fahrenheit on a sunny afternoon in January. A series of boxes mounted on the floor signal the geothermal system. "If we want, it has hot water; if we want, it has chilled water," notes Kapustka, pointing out levers on the pipes.

The system, which even features a state-of-the-art wall-mounted control system ("the brain," Kapustka calls it), is impressive for a number of reasons, not the least of which is its ability to heat and cool an entire complex year round without relying on fossil fuels.

Among the network of pipes is a line that has "raw water" stamped upon it. When asked about it, Kapustka explains that it's carrying rain water, which is collected in an underground tank, filtered and then sanitized through an ultraviolet system. From there, it is transferred to garden hoses, sprinklers, and used to flush the toilets — a highly effective method for conservation.

Outside the building, an extensive stormwater filtration system protects waterways from polluted runoff. Loose gravel (instead of pavement) covering the parking lot creates a pervious surface so that water doesn't just pick up sediment and spill into the stream during a storm. A network of holding ponds descending downhill from the complex offers an aesthetically pleasing, natural filtration system for stormwater.

The office spaces are all designed to allow daylight to gently illuminate the rooms. The effect not only reduces the need to keep the lights on all day, but creates a more comfortable atmosphere for the employees. During a walk-through tour of the building, employees noted that they found their eyes were under less strain in a room that is naturally lit than in one with a glaring fluorescent light overhead. The light fixtures that were installed, meanwhile, are among the most efficient on the market.

Recycled products were used wherever possible during construction. Recycled batt insulation was utilized between office walls as a sound-proofing measure, and other recycled materials, such as fly ash — a byproduct from a power-plant scrubber — was used in the concrete mix.

A few of the UNCA maintenance vehicles that are parked at the Sam Millar Complex are also green, including a biodiesel-powered pickup truck and an electric car.

When the \$6.5 million dollar project was completed, a ceremony was held to dedicate the building to the late Sam Millar. "Dad would especially be happy that this is a green building," his daughter, Georgena Millar, told the crowd gathered there. "That would have really sparked his love for it." ■

Rebecca Bowe is contributing editor at Mountain Xpress, where she writes a weekly environmental news column called "Green Scene." She can be reached at rbowe@mountainx.com or at (828) 251-1333, ext. 154.

Green building certification programs demystified

» Energy Star, N.C. HealthyBuilt Homes and LEED for Homes
by Maggie Leslie

Anyone who talks about green building most likely has a unique definition of what it means. Hopefully, all ideas include elements of sustainability, energy efficiency and natural-resource conservation. In the absence of a universally approved definition of green, a recent wave of certification programs has emerged to prevent greenwashing, and to provide a marketing edge for builders who are willing to make human health and the environment top priorities. In Asheville, there are three certification programs for green building: Energy Star Homes, North Carolina HealthyBuilt Homes and Leadership in Energy and Environmental Design for Homes.

Energy Star is a household name for appliances, but what is an Energy Star home? As with Energy Star appliances, the standards are created by the Department of Energy and inspected by a third party. Energy Star homes go beyond just efficient appliances: Each house is built to be at least 15 percent more energy efficient than if the same home were built to code. This standard is achieved through a combination of well-installed and efficient insulation, HVAC equipment, lighting, water heaters and windows. Each home is first computer-modeled to determine its energy usage, then inspected by a nationally trained home-energy rater to ensure it will perform as planned. Energy Star homes are more comfortable, durable and energy efficient. An added bonus: Progress Energy and Duke Energy currently offer utility-rate discounts for certified Energy Star homes.

The **N.C. HealthyBuilt Homes Program** was created in 2004 through a collaboration between the N.C. State Energy Office, the N.C. Solar Center and building professionals throughout the state. This program is administered locally by the WNC Green Building Council. Every HealthyBuilt home is also an Energy Star home, but the program goes above and beyond energy efficiency. HealthyBuilt homes start with a menu of items, divided into seven sections: site (from erosion control to native plants); water (from low-flow fixtures to rain gardens); building envelope

(insulation and framing); comfort systems (from heat pumps to geothermal systems); appliances, lighting and renewables (solar hot-water system); indoor air quality (from moisture resistance to nontoxic paints) and materials (from recycling to bamboo). Each home must attain a certain number of points in each section to qualify for the certification. These homes are then inspected to make sure each of the goals is actually achieved. Certified HealthyBuilt homes vary in style and price range, from alternative to conventional, high-end to affordable. Three years since its inception, there are approximately 100 HealthyBuilt homes certified, and 492 currently under construction in WNC.

LEED is a green-building rating system created by the U.S. Green Building Council. The LEED Rating System is a nationally recognized standard for green building, but has until recently primarily focused on commercial construction (categorized as new, existing and interiors). After years of development, pilot runs and review, LEED for Homes was launched in November 2007. LEED for Homes is a voluntary rating system, similar to the statewide N.C. HealthyBuilt Homes program. As with N.C. HealthyBuilt certification, Energy Star is a prerequisite, and third-party inspections are required. The USGBC launched a test run of LEED for Homes in August 2005. As of October 2007, 134 homes were certified and 336 were registered across the United States.

For more information about the certification programs:

- www.EnergyStar.gov
- www.HealthyBuiltAsheville.org
- www.usgbc.org

Maggie Leslie is program director of the WNC Green Building Council. She can be reached at maggie@wncgbc.org or at (828) 254-1995.



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Carbon offsetting

» Reduce your impact and benefit your community with Appalachian Offsets

by Matt Siegel

Every one of us has a carbon footprint. A carbon footprint is the amount of carbon dioxide each of us produces during everyday activities. Nearly everything we do in our daily lives contributes to our carbon footprint, from the clothes we buy, to the food we eat, to the computers we rely upon for work. Driving gas-powered vehicles and consuming energy in our homes and businesses are among the more obvious ways we contribute to climate change.

Carbon offsets are intended to balance out these greenhouse-gas emissions. Purchasing carbon offsets reduces the overall amount of carbon dioxide in the atmosphere. For example, if you were to purchase five tons of carbon offsets, you would be helping to implement a project (renewable-energy installation, tree planting, new energy-efficiency measures etc.) that would result in the production of five less tons of carbon dioxide. Essentially, the project takes five tons of carbon dioxide out of the air. For the sake of simplicity, most carbon-offsetting programs only consider transportation, home and business energy use when calculating a carbon footprint.

Why offset your carbon footprint?

After reducing your carbon footprint as much as possible, you can purchase the carbon offset equivalent to your remaining impact. Carbon offsetting is one of many market-driven economic actions you can take to address climate change. While it may not be the answer to global climate change, it is a great educational tool that can have a lasting impact. Through WNC's recently formed Appalachian Offsets, the nation's first locally based program, our



As part of an Appalachian Offsets program, UNCA freshmen volunteers helped install compact fluorescent light bulbs in public-housing units in September 2007.

community benefits directly through improved air-quality and economic gains.

How do you know your carbon offsets are actually reducing greenhouse gases?

As carbon-offset programs become more numerous, criticism is mounting as to the legitimacy and true effectiveness of carbon offsetting. It is important for people to choose programs that are transparent and that achieve real results in terms of combating global climate change. There are a wide variety of local and international carbon-offsetting projects to choose from, including energy efficiency, renewable energy and tree planting.

The recently launched Voluntary Carbon Standard, or VCS, provides a quality-assurance check for voluntary offset projects. The existence of an international standard, according to the World Business Council for Sustainable Development, should lead to more investment into credible offset projects. Guarantees made about the VCS include: Certified offsets will have environmental benefits; the VCS will stimulate greater innovation and investment in a wider range of low-carbon technologies without compromising environmental integrity; and the public will be able to access information on every VCS-approved offset project.

Appalachian Offsets was developed as a way to bring our community together to combat a global problem on a local level. The first Appalachian Offset project, funded by local businesses and



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individuals, took place on Sept. 11, 2007. More than 300 students at the University of North Carolina at Asheville volunteered with the Asheville Housing Authority, the local public-housing agency, and changed out 5,500 incandescent light bulbs for compact-fluorescent light bulbs in only four hours. The 5,500 bulbs will save more than 2.5 million kilowatt-hours, \$220,000 in electricity costs, and will reduce carbon pollution by 1,610 tons over the bulbs' lifetimes. Future projects will include using offset funds to help pay for the installation of solar hot-water systems on affordable-housing units and other renewable-energy projects. The hope is that Appalachian Offsets will serve as a model for other communities. ■

Visit www.appalachianoffsets.org for more information.

Matt Siegel is director of the WNC Green Building Council. He can be reached at matt@wncgbc.org or at (828) 254-1995.

ENERGY SAVING TIP



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Western North Carolina Renewable Energy Initiative

2008 Workshop Schedule

- 4/5-8 Solar Water & Space Heating:
with Clive Martin of Home Power & AM Solar
- 4/19-20 Small Scale Wind Energy:
with Judith West of Windover
- 5/22-23 Photovoltaics:
with Steve Siska
- 7/11-12 Domestic Solar Water Heating:
with MIT & Terra Energy
- 8/27 PV & The National Electrical Code:
with John Giles of the Southeast Technology Development Institute
- 10/4-5 Micro Hydro:
with Don Harris
- 10/16-18 Small Scale Wind Energy:
with Judith West of Windover

Other North Carolina Events:
 March 8 - Energy Showcase, The Pied. Mt.
 August 12-13 - Asheville NC Green Building Council Conference, Asheville, NC
 August 22-24 - Sustainable Design & Energy Conference, Asheville, NC
 November - Workshop, State University of New York, NY

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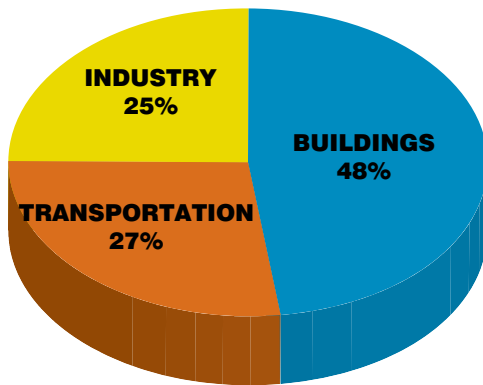
The 2030 Challenge

» A rapid transformation of the global building sector

by Boone Guyton

The 2030 Challenge is a proposal by Architecture 2030, a nonprofit started by architect Edward Mazria in 2002. "2030's mission is to rapidly transform the United States and global building sector, from the major contributor of greenhouse gas emissions to a central part of the solution to the global-warming crisis," according to the program's Web site. "Our goal is straightforward: to achieve a dramatic reduction in the global-warming-causing greenhouse gas emissions of the building sector by changing the way buildings and developments are planned, designed and constructed."

The genius of this approach is that it looks at one sector of the economy: buildings. It then evaluates buildings' contributions to the problem of global warming. Finally, it charts a course toward transforming the building sector. The end goal is to have all buildings be either carbon neutral or using no greenhouse-gas-emitting energy by 2030.



US ENERGY CONSUMPTION

Architecture 2030 has issued the 2030 Challenge, asking the global architecture and building

community to adopt the following targets.

- All new buildings, developments and major renovations shall be designed to meet a fossil-fuel, greenhouse-gas-emitting, energy-consumption performance standard of 50 percent of the regional (or national) average for that building type.

- At a minimum, an equal amount of existing building area shall be renovated annually to meet a fossil-fuel, greenhouse-gas-emitting, energy-consumption performance standard of 50 percent of the regional (or national) average for that building type.

- The fossil-fuel-reduction standard for all new buildings shall be increased to:

- 60 percent in 2010
- 70 percent in 2015
- 80 percent in 2020
- 90 percent in 2025
- 100 percent carbon-neutral in 2030 (using no fossil fuels or greenhouse-gas-emitting energy to operate).

These targets may be accomplished by implementing innovative, sustainable design strategies, generating on-site renewable power or purchasing renewable-energy credits.

This is obviously a dramatic change in the way buildings are typically constructed and operated. It is motivated by a consensus of climate scientists who demonstrate that we have very little time to make major changes to avoid the worst consequences of climate change. The 2007 report of the Intergovernmental Panel on Climate Change included more than 2,500 scientific reviewers from 130 countries, and constituted the strongest statement yet about the state and progress of climate change. Dangerous climate-change effects are likely to be seen at lower temperature increases than previously reported, according to the report. The fact that buildings use 76 percent of the electricity generated, most of which is derived from coal — the most intensive greenhouse-gas-generating fuel — places the building community at the forefront of this battle.

"Over an 11-year period (1973-1983), the United States built approximately 30 billion square feet of new buildings, added approximately 35 million new vehicles and increased real GDP by over one trillion dollars (in year 2000 dollars) while decreasing its energy consumption and CO2 emissions," according to Architecture 2030.

If we look at the technological breakthrough and integration of computers over the last 25 years, we also see the possibilities for global change in a short time. We have the technology now. We need the commitment at all levels — from individuals, businesses, ■■■►

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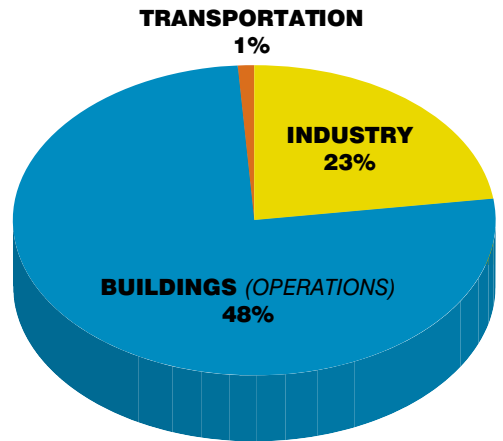
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and local, state and federal governments — to make a transition happen. The costs of relying on fossil fuels, particularly coal, are enormous. We need incentives and subsidies that address the real consequences of relying upon carbon-based fuels. The cost of preventing the worst effects of climate change today is low in comparison with the price we'll pay for doing nothing.



US ELECTRICITY CONSUMPTION

The 2030 Challenge is a clear analysis of the role of buildings in global climate change. It demonstrates the pace at which we need to change in order to avoid the high risks of increased carbon-dioxide emissions from human activity. Some of the risks associated with accelerated global warming are extreme weather events, such as more droughts and floods, sea-level rise and an accelerated loss of species. On the other side of the coin, economic opportunities abound, that our area can take advantage of, in the new economy of energy conservation and clean technology.

The American Institute of Architects, many cities and organizations, including Leadership in Energy and Environmental Design, the U.S. Conference of Mayors and the U.S. Green Building Council, have signed on as supporters of the 2030 Challenge. There are a few from our area, too: Visit architecture2030.org/2030_challenge/onboard to see who supports the challenge. Ideally, this model could be adapted to other segments of the economy, from agriculture to industry to transportation. The problem is big enough for everyone to play a part in finding a solution. ■

Visit <http://architecture2030.org/> for more information about Architecture 2030. Go to www.ipcc.ch to learn about the Intergovernmental Panel on Climate Change.

Boone Guyton is a partner in Cady and Guyton Construction, which builds HealthyBuilt homes. He is also a long-time member and founder of the WNC Green Building Council.



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In context

» Green building for a green landscape
by David Tuch

Far too often, the emphasis of green building is placed on the building itself, to the neglect of the site. If a house built with the most sustainable, and environmentally conscious techniques is located within a development that destroys the natural features and cultural heritage of the surrounding landscape, then an opportunity has been lost. That building could have been integrated into the larger environmental context of the property, but instead, it will most likely look like part of any other development found across the country.

Despite the patterns of development we have seen in our region over the years, there is hope through the application of green site-planning principles. Thanks to an understanding of smart-growth concepts, increasing involvement by our local land trusts and the many active environmental organizations in the region, a desire for a better way to develop our mountains has emerged. The real-estate community has developed an Eco-Agent program to promote green homes; many municipalities in the region have passed stringent hillside and storm-water requirements; and developers are beginning to recognize the benefits and marketing advantages of going green.

Several planning and design principles can be applied to new developments for an environmentally sensitive approach.

The *location* of a property is an important factor for determining the appropriate type of development. A high-density, mixed-use

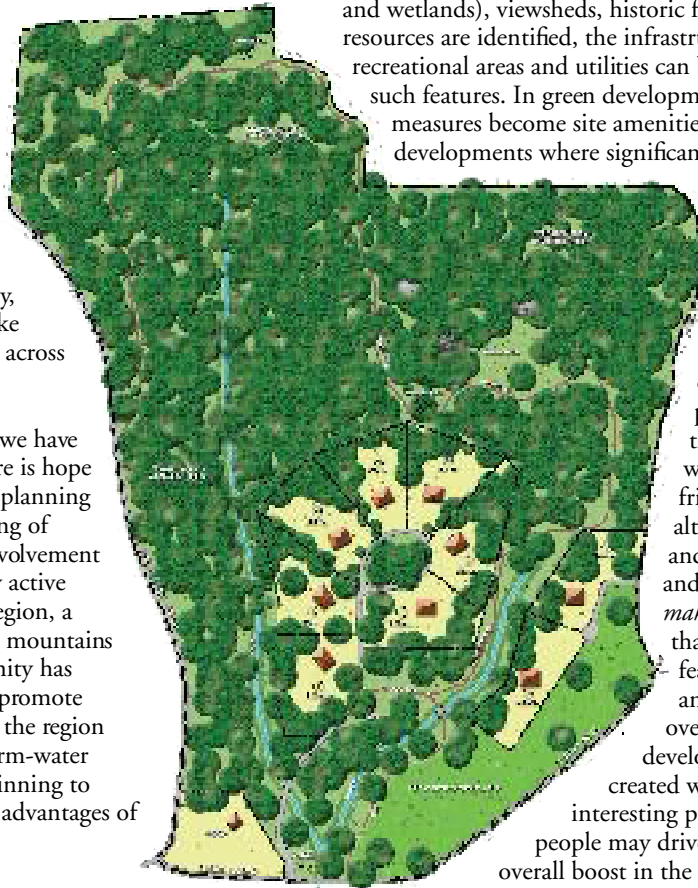
development may not be appropriate for a rural landscape, while a low-density alternative is not appropriate for an urban setting.

With Western North Carolina's natural diversity and mountainous terrain, perhaps one of the most important aspects of site planning is the assessment of a property's unique natural and cultural resources. These resources can include habitat, rare plants and animals, agricultural areas, water resources (streams, seeps, springs and wetlands), viewsheds, historic features and uses. Once these resources are identified, the infrastructure of roads, buildings, recreational areas and utilities can be located to protect or enhance such features. In green developments, these conservation measures become site amenities for the development. In rural developments where significant acreage is protected, the

undeveloped areas may qualify to be placed into conservation easements, which permanently protect the undeveloped areas for future generations.

In urban settings, the emphasis on land conservation and preservation lies in protecting the water quality of streams and waterways, creating pedestrian-friendly communities that promote alternative modes of transportation, and accommodating a mix of uses and a diversity of people. *Place-making*, or the creation of spaces that are infused with character and features that promote an enjoyable and livable neighborhood, is often overlooked as a component of green development. But if developments are created with the intention of providing interesting places to live, work and play, people may drive less — and the result can be an overall boost in the quality of life.

Whether a development is located in a rural, suburban or urban area, several environmentally based planning and design principles should be integrated into the overall design of every green development. The use of Low Impact Development techniques, such as bio-retention areas, constructed wetlands, green roofs, ■■



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bio-swales, riparian buffers and porous paving help minimize impacts on our waterways. Appropriate design of roads and architecture can minimize construction impacts, such as massive earth moving and alteration of the landscape. Energy-conservation principles, such as passive solar and/or solar panels, should be explored, in addition to utilizing landform and vegetation to help reduce energy needs of a building or home. With the current drought, emphasis on water conservation through rainwater collection and gray-water reuse is becoming more important. Rainwater collection can be used for vegetable gardens and even for indoor use. The materials used for the buildings and the landscape improvements, such as retaining walls and plantings, should be local, recycled or sustainable. Native plants can be used not only for landscape improvements, but to restore formerly derelict or impacted landscapes.

When a site's significant natural and cultural resources are protected and several of the above principles are used in combination with one another, the integration of a well-planned, environmentally sensitive development will be evident. Green building works best when both the buildings and the overall development of a property are approached from the same perspective of environmentally sensitive design. ■

David Tuch is vice president and landscape architect (RLA) for Equinox Environmental, an award-winning firm focusing on resource conservation and sustainable development throughout the region. He can be reached at (828) 253-6856.



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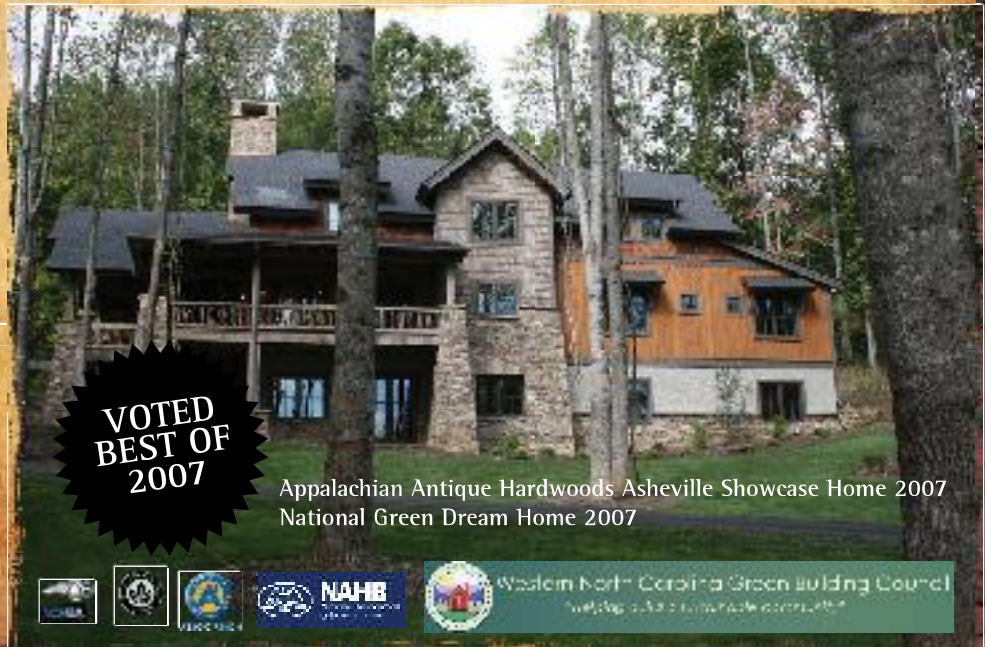
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Erosion control for green building

» The dirt on how to retain soil

by Kevin Caldwell



If your building site looks like this, you need a lesson in erosion control.

Soil is an amazing resource that is often overlooked as “dirt.” Soils are dynamic, living systems, the health of which dictate the health of forests, farms, wetlands and wildlife. But they are a nonrenewable resource, at least as far as our lifetimes are concerned. Consequently, our impacts upon them are long-term.

On mountain slopes, one inch of topsoil forms naturally in about 1,000 years. In new developments that lack proper erosion controls, a few thousand years of topsoil are lost in a single rainfall. In North Carolina, up to *100 tons of topsoil per acre* have been documented as eroding off construction sites. By volume, soil erosion is the *single greatest water pollutant* in the state. It comes with a very high price: death of fish, smothered fish eggs, destroyed aquatic food webs and increased water-filtration and hydro-electric-power-generation costs.

And yet, erosion control can be performed easily and affordably. Creating and following an erosion-control plan is the key. The N.C. Sediment Pollution Control Act requires a sediment-control plan for soil disturbance on one or more acres, submitted and approved by the city or county planning board prior to construction. The law mandates slope stabilization, groundcover establishment, stream buffering and adherence to the plan. Failure to submit or follow the plan can result in fines up to \$5,000, stop-work orders and restoration fees. For more information, contact the N.C. Division of Land Quality for a copy of their Erosion Control Manual, or subscribe to *Sediments*, a newsletter of the N.C. Sedimentation Control Commission.

Despite these regulations, most home sites impact less than one

acre, and thus require no sediment-control plan approval. But why not make one anyway? A good plan will address square footage, aspect, slope, seed quantity and type, materials, timing, expense and maintenance. Typical materials include: staked silt fencing, wire fence (for backing silt fence on steep slopes), straw mulch, crank-seeders and seed. For ditches and roadsides, materials may include seeded fiber-mats, coir logs and/or straw wattles or bales for sediment traps.

Before breaking ground, consider some of the following ecological-planning guidelines:

- Photograph existing conditions in excavation zones, noting native trees, shrubs and herbs. Strive to return cleared areas to natural conditions.
- Remove exotic-invasive plants near clearings *prior to excavation*. These invaders will dramatically increase after excavation due to increased light on fresh soils.
- Bank topsoil and restore it to exposed subsoils prior to seeding. Store topsoil away from streams, drives and roads. Cover it with plastic, or seed with annual rye.
- Preserve existing soils and vegetation where possible. Remember that covering tree bases with soil usually kills them.
- Seed and mulch exposed soils within 24 hours of grading, especially on steep slopes. Plan to finish up before moderate to light rain.

Once you've broken ground, there are a few important steps to take. First, install silt fencing at the base of exposed slopes, trenching the fence base with 6 to 8 inches of soil. In steeper areas, consider backing silt fencing with hard-wire fence and metal stakes for support. Additional rows of fencing should be placed in coves and mid- to upper-slopes, depending on the steepness and width of the cut. Monitor fences, as they often require maintenance until vegetation is established.

Hydro-seeding is best for large areas and steep slopes. Smaller sites can be controlled with hand-seeding much more affordably, with similar results. Try to use native sources when possible. Ernst Conservation Seed (www.ernstseed.com) and Roundstone Native Seed (www.roundstoneseed.com) offer numerous native-plant mixes tailored to all moisture and light gradients. As for non-natives, weeping lovegrass is an excellent, noninvasive, mat-forming perennial that is hydro-seeded for best results. Other good non- ▶▶▶

native seed mixes include brome grass, ryes, purpletop, creeping fescues and mixed clovers for nitrogen fixation. You'll need from 20 to 50 pounds of seed per acre, but keep some aside for touchup seeding later.

Seeding is best performed immediately following grading while soils are compact but textured, especially if rain is expected in the next day or two. For steep areas, begin seeding at the slope base, seeding a width of 8 to 12 feet, then mulch. Repeat in strips moving upward, allowing gravity to carry seed and straw downward. For less steep areas, follow parallel lines, watching carefully for good seed coverage. Return on a parallel path, overlapping slightly with the previous batch of seed.

Ditches are a major source of sediment, and difficult to control. Ditches should be lined and staked with seeded fiber mats, upon which coir-log or straw-bale or wattle sediment traps are placed, in lieu of gravel or rock dams. Traps are located so the bottom of the upper trap is at the same elevation as the top of the lower trap. Recent Department of Transportation studies have shown these traps remove 10 to 800 times the sediment of rock dams.

Ultimately, proper erosion controls maintain the health of our rivers and streams. Leaders in green building and environmental awareness have a duty to be regional models for keeping soil on the land and our waters free of sediment. ■

Kevin Caldwell is a conservation biologist and planner with Mountains-to-Sea Ecological, helping green builders, eco-communities and landowners to incorporate, protect and manage the unique natural resources of their lands.

A Green Campus, by Nature and Design

The Warren Wilson College community is working to lessen its impact on the environment, as the campus Green Walkabout® brings sharply into focus.

The Green Walkabout®, a major initiative of the College's Environmental Leadership Center, tells the ongoing story of sustainability at Warren Wilson. It highlights sustainable practices in many areas of the campus, including building design and construction, recycling and waste reduction, and landscaping. With such efforts, it's no wonder that Outside magazine has called Warren Wilson "one of the most earth-friendly colleges on the planet," and Sierra magazine has ranked the College No. 3 nationally among its "10 Coolest Schools" in the fight against global warming.

For more information about the College's Green Walkabout®, call 828-771-3006 or write scross@warren-wilson.edu.

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Rain harvesting

by Shawn Hatley



These timber-lined containers are proof that rainwater tanks don't have to be eyesores.

photo courtesy of BRAE

What about rainwater harvesting? It's true that in order to collect rainwater, it must rain. But when it does rain, as many as 60,000 gallons of rainwater per year may fall on a 2,000-square-foot roof in the Mid-Atlantic states. Harvesting this amount from just 100 homes in a single neighborhood, we could easily conserve 6 million gallons annually. How many neighbors do you have?

Consider this: If just 15 percent of residential landscapes in the United States were irrigated with rainwater, more than 1 billion gallons of water could be conserved daily, according to the American Rainwater Catchment Systems Association.

In addition to the obvious advantages of rainwater — it's free of charge, and it doesn't have to be treated or transported over long distances — there are two important arguments for utilizing this resource:

1. As a supplement to drinking-water resources, utilizing rainwater has the benefit of saving precious, potable water.
2. By reducing the impacts of stormwater runoff, rainwater harvesting protects water quality and limits the flooding and degradation of streams and lakes.

How do we harvest rain?

By simple definition, rainwater harvesting means collecting the rain

for later use. When deciding which rain-harvesting system is right for your project, consider the following:

- **Budget:** If you have a specific dollar amount in mind, then your simplest task is picking the best system for your well-earned dollar. Remember, storage is the No. 1 cost for rain-harvesting systems, and most above-ground tanks are more affordable than below-ground. Systems can cost as little as a few hundred dollars, and as much as tens of thousands of dollars.

Myth No. 1: Rainwater systems are expensive! Debunked: With complete rainwater systems available in all price ranges, you can easily select a system that is right for your budget.

- **Project goals:** Not all projects are the same. If you are a hobbyist, perhaps you want a system with small to medium storage capacity and good water pressure for outdoor gardening. Maybe you have a drainage problem and want a system big enough to prevent water from entering a basement or a neighbor's property. Are you living in a community that prevents the use of city water for landscape irrigation? If so, choose a system large enough to maximize collection potential. If your system will be used for fire protection, aim for a higher capacity.

- **Do-it-yourself or do-it-for-me?** Selecting the right system is a big step, but getting it installed and operational can be a bigger step — depending on which system you choose. Not all systems require professional services, however. If you require professional installation of your rainwater system, choose a locally available contractor whom others recommend.

What is included in a complete rainwater system?

- **Filtration:** This is the initial step for ensuring only the highest quality water enters your storage tank. Filter water before storing water!

- **Storage:** The most important component of a rainwater system. When selecting a rainwater cistern/tank, ask yourself: Will I store the water above ground or below ground? What appearance do I want for my above-ground tank — wooden, steel or plastic? How much storage do I need?

Myth No. 2: Rainwater storage tanks are ugly! Debunked: Rainwater storage does not have to be unsightly or ugly. There are many attractive above-ground storage tank options to choose from. How about installing your storage below ground? It is hard to be ugly if it is out of sight! Design tip: Use black or dark-green tanks opaque to light for above-ground storage. Tanks that are not opaque allow light to grow algae in the water and cause water-quality problems.

- **Pump systems:** Pump systems deliver rainwater to end-use applications. They can be sized to pressurize small garden hoses, supply school buildings with rainwater to flush toilets, or to irrigate ball fields.

Myth No. 3: Rainwater systems do not have pressure! Debunked: Rainwater collection systems are often offered with pump systems ▶▶▶

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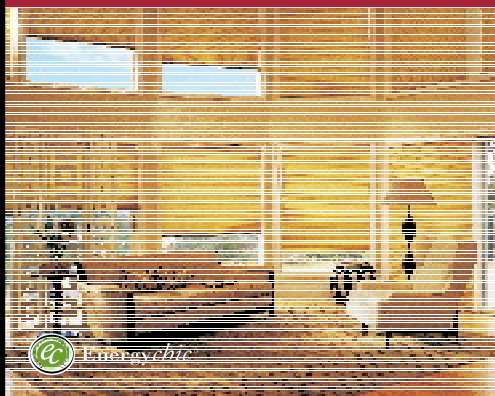
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that can deliver 5 to 500 gallons per minute. Rainwater systems don't have pressure if you rely on gravity, because for every one PSI (city/well water is generally 30-50 PSI) you would have to elevate your tank 2.31 feet. To get 30PSI, you'll need to elevate your tank 69.3 feet. I hope you live in the mountains!

• **Water treatment:** This refers to the process of purifying rainwater to meet end-use water-quality requirements. For example, irrigation systems require sediment screen to prevent clogging of spray heads. Projects requiring a higher level of protection use high-efficiency carbon filters and/or ultraviolet disinfection as the ecological choice for non-chemical water purification.

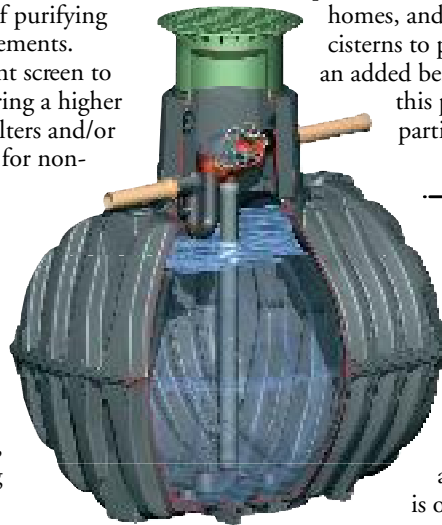
Where can I rain-harvest?

Anywhere! Rainwater systems can incorporate simple rain barrels located below a single downspout to capture the rain, but can also be large tanks located below ground at a school for collecting the millions of gallons of rainwater each year. Office buildings, churches, houses, parks, zoos, schools and manufacturing facilities are all suitable locations to collect the rain. Below are a few more common applications.

• **Water supply:** Common challenges include low-producing wells, high irrigation demands, expensive municipal water, and/or lack of water, period. Rainwater offers a supplemental water source to existing water supplies (well, spring, city water) and can help meet more than 65 percent of daily nonpotable demands.

• **Stormwater runoff/drainage control:** With real-estate values skyrocketing, the costs of stormwater damage to your investments can decrease their value tremendously and increase your liability. Rainwater harvesting is a best-management practice for reducing stormwater runoff. Ideal for use in combined sewer or high flood-risk communities, rainwater cisterns capture stormwater during heavy rains, mitigating flooding of sewers and flood-susceptible areas and protecting sensitive water quality in streams, lakes and rivers. Rainwater cisterns store rooftop runoff, thereby diverting rainwater away from structures. This practice helps avoid problems associated with water seeping into basements or crawl spaces and creating wet-mold problems.

• **Fire protection:** Today, it is more common for neighborhoods and commercial facilities to integrate cisterns with fire-protection systems. Due to the remote location of some homes and commercial buildings in mountain regions, available water supplies for fire protection are severely limited or not present. To address this problem, rainwater cisterns are being installed for individual homes, and communities are integrating single, large cisterns to protect multiple homes in case of fire. As an added benefit, some insurance providers recognize this practice and provide reduced premiums for participating projects.



BRAE's underground Carat rainwater cisterns offer 1,000 or 1,700 gallons of storage capacity, and it all stays out of sight.
image courtesy of BRAE

With the South experiencing unprecedented drought, our communities will continue searching for ways to supplement and extend available water resources. Rainwater harvesting is one practice out of many that will help meet water-supply challenges throughout the Southeast.

Easily taught and simple to implement, challenge yourself to add a rainwater-harvesting system to your home, business or school. You may be surprised how much water it will collect! ■

Shawn Hatley is the Southeast regional representative for the American Rainwater Catchment Systems Association (www.arsca.org), and the president of BRAE (www.braewater.com). He practices as a LEED-accredited professional.

ENERGY SAVING TIP



Service your home's heating and cooling (HVAC) system
Clean the unit and replace filters in the furnace and humidifier to ensure the equipment is running at its most cost-efficient and at optimum capacity.

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Biodiesel

»» A renewable fuel for construction equipment and building heating

by Brian Winslett



Mitch Mechanic, of Blue Ridge Biofuels, makes the rounds with Bioheat.

photos by Jonathan Welch

You've probably heard of biodiesel as a replacement to petroleum diesel for on-road transportation vehicles, but many people aren't aware of its wide variety of other uses. There are a number of different kinds of diesel, also called distillate fuel: highway diesel, off-road diesel (dyed red), kerosene, fuel oil (also known as No. 2 heating oil), No. 1 diesel and so on. All of these fuels are very similar, differing primarily in their taxation structure and residual pollutant content, which ultimately impacts emissions. And they can all be substituted with biodiesel.

Biodiesel heating oil and biodiesel-powered equipment — such as bulldozers, graders, generators and work trucks — represent simple ways to make both the construction of a new building and the impact of heating the building itself greener.

Biodiesel's broad benefits

No fuel is perfect and not all biofuels are created equal, but there are many benefits to using biodiesel. On the environmental side, it's renewable, biodegradable, nontoxic and offers a 70-percent emissions reduction as compared with conventional diesel. It also offers the best energy balance out of all fuels.

There are mechanical benefits as well. No equipment modifications are required. The higher lubricity extends engine life, and it has higher cetane (the diesel equivalent of an octane rating for gasoline) than petroleum. It offers more miles per gallon, mixes with distillate fuels at any ratio, and cleans fuel systems and injectors.

There are health advantages, too, since unlike with conventional diesel exhaust, exposure to biofuels emissions is not associated with major health risks.

Biodiesel also supports economic health and national security by supporting small business, boosting local job creation, keeping revenue streams in our economy, decentralizing energy and reducing dependence on foreign oil.

Fueling the construction and grading process

Typically, little attention is paid to the carbon impact of construction equipment used in the early stages of development. Most grading equipment is diesel-powered, making it a good fit for biodiesel. Off-road diesel fuel pollutes more than highway diesel fuel, representing a greater impact to regional air quality. Nor does off-road equipment require any emissions-control devices. Because off-road vehicles such as bulldozers operate in a small area, the immediate environment can become very polluted in a short period of time on windless days, ultimately resulting in a health hazard to the operator.

On-site, diesel-powered electrical generators, cement mixers and other construction equipment have a similar impact on a microclimate's air quality. All diesel-powered equipment can be switched seamlessly to B20 (20 percent biodiesel and 80 percent petro diesel), and even to B100 (100 percent biodiesel) with a few minor initial maintenance procedures. Clearing and grading a construction site is possibly one of the greatest environmental impacts for a site. A simple switch to clean, renewable fuel is a win-win solution for immediate environmental-impact reductions. ■■■➔



On-road highway work trucks, meanwhile, are often diesel powered and represent an additional opportunity to reduce impacts related to the work site.

Heating the home and business

In most cases, passive solar-thermal design is your best option for heating new homes, but a backup heat source is generally necessary. Highly efficient, new oil furnaces are great candidates to run on higher blends of biodiesel. Bioheat, which consists of a blend of conventional heating oil and biodiesel, is compatible with all oil furnaces, representing a seamless transition to renewable fuels. In fact, using Bioheat fuel will keep your furnace system much cleaner and reduce maintenance requirements while providing the same performance as petroleum oil.

With some retrofitting and cleaning procedures, most older furnaces are good candidates for higher biodiesel blends as well. When comparing Bioheat to clean-burning natural gas and propane, it is important to realize that these clean fuels are fossil fuels and do contribute to the atmosphere's net greenhouse gas emissions. ■

Brian Winslett is co-owner and community relations director of Blue Ridge Biofuels, Asheville's own local biofuels producer and distributor. For more information on their various blends, products and services, visit www.blueridgebiofuels.com or call (828) 253-1034.

ENERGY SAVING TIP



Change faucets and showerheads to low-flow

If your bathroom was designed before 1992, your showerhead probably puts out 5 gallons of water a minute, so a 10-minute shower can use 50 gallons of water! Low-flow showerheads can cut that water usage in half.

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Lighting for less

»» Energy-efficient lighting options

by Matt Siegel and Candice Black

For the past 120 years, the incandescent light bulb has been lighting our homes and offices. But over the past 10 years, a new technology has been developed that can cut lighting costs 30 to 60 percent, enhance quality and reduce environmental impacts, according to the Department of Energy. With the introduction of compact fluorescent light bulbs and Light Emitting Diodes, we all have reason to change out our lights.

When compact fluorescent light bulbs were first introduced, they were costly and didn't always provide quality lighting. Today, the price of a 13-watt CFL (which provides roughly the equivalent of a 60-watt incandescent) typically starts at just a dollar, and the light quality has greatly improved. And thanks to their high efficiency, savings in energy costs can provide a quick return on the cost of the bulb. For a light that's on for only three hours per day, the payback for changing to a CFL can be as little as four months. For a light that's on for 10 hours a day, such as a porch light that's left on all night, the payback is about one month.

Compact fluorescent light bulbs produce less heat than incandescent bulbs, last up to 10 times longer and use 75 percent less energy, benefiting both the environment and your pocketbook. CFLs are also available as spotlights, floodlights, three-way lights, dimmable lights and in many wattages. If every person in North Carolina installed a single CFL to replace an incandescent that was kept on for three hours per day, the energy savings would be over a million kilowatt-hours (kwh) and \$100,000 each and every day, according to the calculations of the WNC Green Building Council. Six billion dollars leaves the state each year for energy resources; a switch to CFLs would help keep part of that sum in our local economy.

Need more convincing? Over the life of a bulb, replacing one incandescent with a CFL eliminates as much carbon dioxide from the atmosphere as not burning 500 pounds of coal, according to an article in the August 2005 issue of *National Geographic*. Change four bulbs, and it's as if you've prevented a ton of coal from being burned over the course of a year.

The newest type of energy-efficient lighting is LED technology, which uses 90 percent less electricity than an incandescent bulb, lasts over 50,000 hours and gives off little heat. Currently, Energy Star-qualified traffic signals and exit signs use LED lighting. Thanks to a rapid increase in usage, the price of LEDs is going down, especially for commercial applications. Since exit signs are on 24 hours a day, switching to LEDs is a smart move: They use only 44 kwh per year, versus 350 kwh for incandescent signs, and provide a six-month payback.

Located in Raleigh, the LED City initiative is an expanding community of government and industry parties working to evaluate, deploy and promote LED-lighting technology across the full range of municipal infrastructure. When applied on a citywide scale, LEDs



photo by Jonathan Welch

can save 40 to 70 percent of the electricity used in certain lighting applications, such as parking garages, parking lots, outdoor public areas, street lights and portable lighting.

In January 2007, the city of Raleigh implemented its first pilot project on the third level of the Avery C. Upchurch Government Complex parking garage. This was the first LED City initiative between Raleigh and Cree Inc., geared toward saving tax dollars and protecting the environment. The city, with the help of Cree Inc. and Progress Energy, predicts that the 141 LED fixtures installed in the parking garage could produce electricity savings of 46,720 kwh per year. Thanks to the long life span, the savings in LED maintenance costs each year will result in an additional \$3,000. The total savings will be \$6,200 annually — resulting in a seven-year payback on the initial \$42,000 investment.

If LED lighting were rapidly adopted throughout the United States over the next 20 years, electricity demands could be reduced by 62 percent, according to the Department of Energy, eliminating the need to build 133 new power plants. The environmental benefit of such a move would amount to 258 million tons of carbon ■■

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dioxide not entering the atmosphere, while the financial savings are projected at \$115 billion. With initiatives such as LED City, the future of energy-efficient lighting is looking bright! ■

Resources:

- www.eere.energy.gov/states/alternatives/lighting_daylighting.cfm
- www.energystar.gov
- www.ledcity.org

Matt Siegel is director of the WNC Green Building Council. He can be reached at matt@wncgbc.org or at (828) 254-1995. Candice Black is outreach coordinator at WNCGBC. She can be reached at candice@wncgbc.org or at (828) 254-1995.



ENERGY SAVING TIP

Replace incandescent light bulbs with CFLs

According to the Department of Energy, if every American household replaced just one incandescent with a CFL, we could save enough energy to light more than 3 million homes for a year and prevent greenhouse-gas emissions equivalent to that of some 800,000 cars. But CFLs contain trace amounts of mercury, so remember to dispose of them properly. Visit www.buncombecounty.org/governing/depts/GenServices/solidwaste_recycling_lightbulbs.asp to find out more.

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Take advantage of energy tax incentives ... now!

by Matt Siegel, with assistance from Chad Storck



Deltec Homes, which specializes in circular abodes, recently installed 273 photovoltaic panels at its West Asheville facility through a partnership with Sundance Power Systems. *photo courtesy of Deltec Homes*

due on this amount would be \$7,500. Then you would apply the credit and owe only \$5,500. The net difference is \$1,500 in favor of the credit. Therefore a tax credit is much more valuable than a tax deduction.

What kinds of tax credits are available for renewable energy?

- Residential: North Carolina offers a 35 percent tax credit of up to \$1,400 for water heating, \$3,500 for active- and passive-solar space heating and \$10,500 for photovoltaic, wind and hydroelectric systems. The credit can be taken over five years. However, it cannot exceed 50 percent of the taxpayer's liability. The federal government offers a 30 percent tax credit for solar equipment, up to \$2,000.

For example, if you spend \$4,000 on a solar hot-water heating system, you are eligible for a tax credit of \$1,400 (subject to limits) from the state and

Tax credits for builders of energy-efficient new homes and for renewable-energy installations expire at the end of 2008, so now is the time to invest in clean energy.

First, what is the difference between a tax credit and a tax deduction? A tax deduction is an amount you are able to "deduct" from your total income in order to decrease your tax liability, or the amount of tax you will owe the government. A tax credit is an amount of money that is subtracted from the amount of actual tax you owe after all of your deductions have been figured in. For example, if your annual income is \$30,000, you are eligible for a \$2,000 deduction, leaving you with \$28,000 of taxable income. If you are taxed at 25 percent (rates vary), your tax due would be \$7,000. Using the same numbers, if instead the \$2,000 is a credit, you would have \$30,000 of taxable income taxed at 25 percent and your tax

a \$1,200 tax credit from the federal government. You will have to pay some federal tax on the \$1,400 state credit — approximately \$350 if you are in the 25 percent tax bracket. Ultimately, this means purchasing a \$4,000 solar water heater only costs \$1,750 at the end of the day.

If you spend \$10,000 on a one-kilowatt photovoltaic system, you are eligible for a tax credit of \$3,500 (subject to limits) from the state and a \$2,000 tax credit from the federal government. You will have to pay some federal tax on the \$3,500 state credit — approximately \$875 if you are in the 25 percent tax bracket. But in the end, purchasing the solar PV system would cost \$5,375. This system would also generate \$275 in electricity annually if sold to NC GreenPower at \$.21 per kilowatt-hour. ➡

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• Commercial: For commercial business properties, there is a \$2.5 million limit on tax credits taken in North Carolina, and credits cannot exceed 50 percent of the taxpayer's liability. There is no limit for the federal credit. The 35 percent state tax credit can be applied to PV, solar thermal for water heating, pool heating and space heating, as well as passive space heating and daylighting. The state tax credit also applies to an array of other renewable energy resources. The state credit is taken over five years. The federal tax credit of 30 percent applies to solar technologies, including PV, solar-hybrid lighting and solar thermal for electricity generation, process heat, space heating and water heating. The other major tax incentive for commercial installations is the accelerated depreciation on the solar equipment, known as MACRS. Below is a breakdown of the potential economics of a commercial PV system over five years.

Given a 25 percent tax bracket, and assuming the company is able to use the tax incentives over five years:

- \$100,000 (initial cost for an 11 kw photovoltaic system)
- \$30,000 (30 percent federal tax credit)
- \$35,000 (35 percent state tax credit)
- \$17,500 (tax benefit of MACRS over no more than five years)
- \$3,900 (tax benefit of state depreciation over no more than five years)
- + \$8,750 (federal tax on state tax credit)
- \$14,755 (generated income for electricity through NC GreenPower at 21 cents/kwh over five years)

\$7,595 (total remaining of initial investment after five years)

What kinds of tax credits are available to contractors for home energy efficiency?

Contractors of new homes are eligible for a \$2,000 federal tax credit if their home is certified by a home energy rater to be 50 percent more efficient than the 2004 International Energy Code. This credit is available per home and is part of the general business credit.

Reaching the 50-percent threshold for the credit is difficult — but possible — to achieve, and the benefits of a 50-percent reduction of energy use are long-lasting for homeowners and the environment. ■

If you are interested in taking advantage of these tax incentives, the WNC Green Building Council encourages you to consult with your tax accountant to find out how they would work with your unique tax situation.

Matt Siegel is director of the WNC Green Building Council. He can be reached at matt@wncgbc.org or at (828) 254-1995. Chad Storck is a certified public accountant at Dixon Hughes PLLC.

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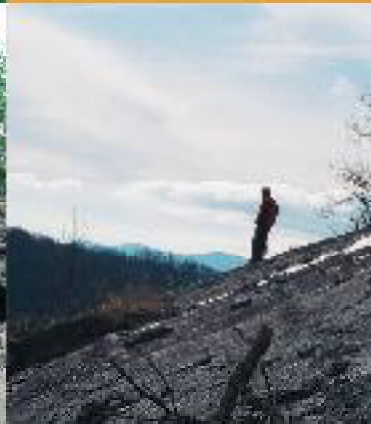
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Emerging solar technologies

» Cutting-edge research produces more efficient, more affordable systems

by Monique Hanis

We are witnessing an exciting time in the solar-energy sector. Research facilities, universities and companies are striving to develop new and innovative solar technologies for the commercial and residential sectors. From building-integrated and thin-film materials, to concentrating-solar and solar-thermal applications, the options for converting the sun's rays into energy are expanding like never before. Meanwhile, improvements in technology, manufacturing processes and installation are converging to help drive costs down.

Federal incentives, along with state and local rebate and loan programs, are now lessening the up-front costs of solar energy. In fact, a number of companies including Google, Wal-Mart, Best Buy, Macy's and Safeway have plans for significant solar photovoltaic, or PV, installations as part of their energy-efficiency programs.

Advancements in PV technology continue as researchers at the National Renewable Energy Lab, University of Delaware, Sandia National Lab and others create new combinations of layered-cell



Nevada One, a utility-scale concentrating solar power plant in Boulder City, Nevada. *photos courtesy of SEIA*



Solar evacuated tubes at the University of Cincinnati team house at a Solar Decathlon event in Washington, D.C., in October 2007.

structures that split and refract sunlight for more efficient energy production. Prototype PV cells have reportedly reached 42 percent efficiency, nearly three times the 15 to 22 percent in today's PV panels. Other innovations — like the trackers at Nellis Air Force Base that rotate 15-megawatt PV panels to follow the sun — improve performance by 30 percent.

Thin-film solar — a new technology — does not use silicon, the basic component of PV panels. Instead, a combination of copper, indium, gallium and selenide (CIGS) or cadmium telluride are effectively painted onto a thin, flexible backing to create a semiconductor material. They can be produced in large, rolling sheets or incorporated into building materials, including roof shingles and tinted windows.

While thin-film materials are less efficient than the typical PV solar panel, they are 20 to 40 percent less expensive and can be incorporated on larger surface areas of a building. Companies like Miasole, First Solar, Applied Materials and Dow Chemical are all working hard to improve and deploy thin-film technology.

The big news in solar this year? Nevada Solar One, the first concentrating solar power, or CSP, plant in the United States. The parabolic-trough design uses mirrors to focus the sun's energy to heat a tube of oil, which is used to run steam-powered turbines to produce electricity. The utility-scale project in Boulder City, »

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Nev., went online in June and produces 64 megawatts of electricity — enough to power 15,000 homes. Acciona Energy, the Spanish company that built Nevada One, announced plans for another 200-megawatt CSP plant in the next three years.


Perhaps the most interesting new solar-thermal technology is the absorption chiller: a closed-loop system that converts solar-heated water into air conditioning. Water heated by the sun through flat-panel collectors or evacuated tubes is subjected to a low-pressure loop with lithium bromide that causes the water to reach a cool 44 degrees Fahrenheit. This cooled water runs through copper piping; air forced over the coils produces air conditioning.

State and federal energy policy will also drive the deployment of small, distributed generation of solar on rooftops, as well as large-scale solar plants. While Congress missed a huge opportunity to extend federal solar incentives beyond December 2008 with the 2007 energy bill, state policies are leading the way — from California to New Hampshire. Meanwhile, industry and solar advocates across the nation are gearing up for a new fight. They want measures passed to spur solar development and to make its cost comparable to that of traditional fossil fuels by 2015 or 2016. ■

Resources:

- www.nrel.gov/solar • www.sandia.gov • www.Rotartica.com
- www.solardecathlon.org • www.seia.org

Monique Hanis is director of communications for the Solar Energy Industries Association in Washington, D.C.



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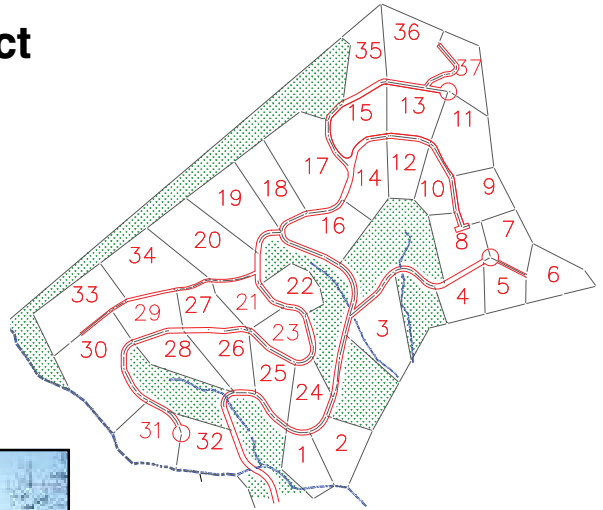
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MEMBER

Checklist: Air sealing

by Maggie Leslie



Hidden air leaks in your home are like unseen holes in your wallet. *image courtesy of Energy Star*

Air sealing is a crucial part of building a healthy, energy-efficient home. Below is a checklist of items to use to ensure proper air sealing when building or renovating a conventional stick-frame home. A leaky home will decrease the R-value of your insulation, create unwanted drafts and comfort issues, and bring moisture and pollutants into the home. As the saying goes, “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, or an approved putty material.
- Seal bottom plate and top plate of exterior walls and knee walls 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 subfloor. 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, durable air barrier should be installed in direct contact with that insulation.

- Provide insulation wind baffle or other air barrier 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 span the cantilever and any exposed edges of insulation.
- For fireplace cavities on exterior walls, a rigid air barrier must be fully aligned, with insulated framing in framed shaft behind fireplace and any gaps 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 fully sealed with caulk or foam.

- Recessed light fixtures (if installed in insulated cavities) should be rated IC (Insulation Contact) and airtight. Once installed, they should be sealed to the drywall with gasket, caulk or foam.
- All holes or penetrations in the building envelope should be sealed with a material capable of stopping airflow. Fibrous insulation does not stop airflow.

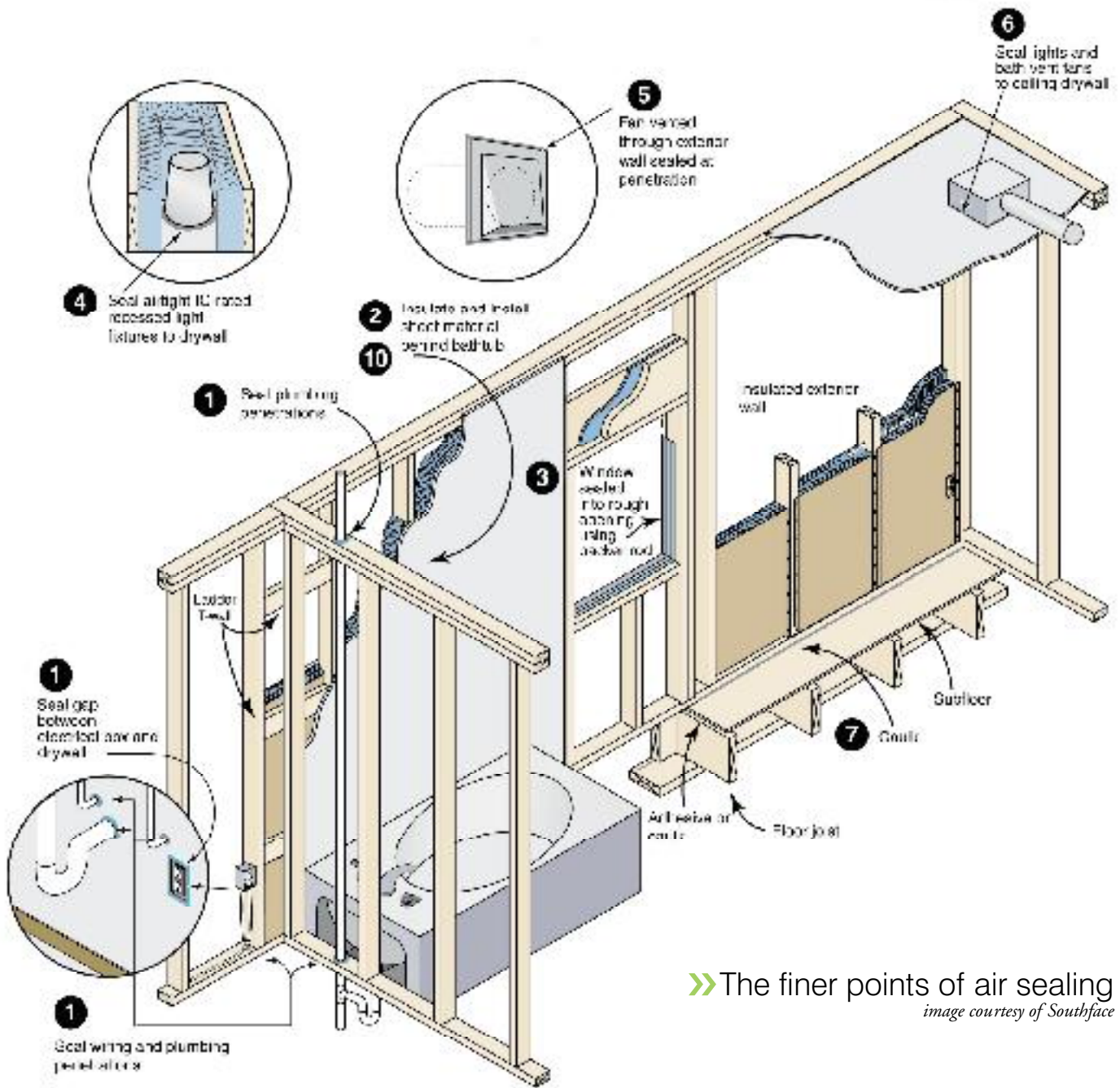
Sources for this checklist included *Advanced Energy System Vision Guidelines*, *Southface Energy Institute Technical Bulletins*, *HealthyBuilt Homes program guidelines* and *Energy Star guidelines for homes and indoor quality*.

ENERGY SAVING TIP



Add weather stripping around doors and windows

Use of door thresholds, window caulking and plastic window film could save up to 20 percent of energy costs with an investment of as little as \$25.



» The finer points of air sealing
image courtesy of Southface



ENERGY SAVING TIPS

Seal leaky ductwork

More than 20 percent of the average home's heating and cooling bills go to duct leakage. Seal your ducts with mastic to minimize the waste of conditioned air.

Install a tankless water heater

By creating hot water on demand, as opposed to continuously heating stored water, homeowners can save hundreds of dollars over time.

Checklist: Indoor air quality

by Maggie Leslie



Ensuring healthy indoor air quality in a home starts with the very foundation. Many simple building techniques, from radon-resistant construction to drainage planes, can prevent unwanted air-quality problems in the future. It is very important to build a tight home to prevent unwanted moisture and contaminants from entering, but it is also important to provide ventilation to the home to provide fresh-air exchange. Once the home has been constructed as healthily and durably as possible, consider the interior finishes and the chemicals used in glues, paints and stains. Below is a checklist of items to help ensure healthier indoor air. For more information, review the Energy Star Indoor Air Package requirements at www.EnergyStar.gov.

Moisture Management

- Install a continuous drainage plane behind the exterior cladding.
- Install a capillary break between foundation and framing.
- Fully and properly flash windows, doors and roofing.

- Install a surface-water management system. Final grade should be at least a half-inch per foot sloped away from the house. Gutters must be present and functional, and must drain onto a finished grade at a minimum of five feet from the building foundation.
- Crawl-space flooring should have 100-percent coverage with a sealed vapor barrier. Consider a sealed, nonvented crawl space for added durability.

Ventilation

- Install a properly sized and sealed HVAC unit (see “Heating and cooling equipment” checklist). The home needs to maintain less than 60 percent relative humidity.
- All ventilation exhaust fans (bathrooms, range hoods and clothes dryers) need to be vented outdoors. Kitchen-range hoods should not exhaust more than 350 cubic feet of air per minute. Bath fans should exhaust at least 50 cfm, so installing a 75- or 90-cfm bath fan is recommended to make up for duct length. Consider installing low-sone fans on a timer or a humidistat.
- Install Minimum Efficiency Report Value 8 or higher HVAC filters, but make sure the equipment is designed to accommodate pressure drop from the filter.
- Protect ducts from dirt and debris until construction is completed.

Combustion Safety

- Combustion equipment, such as gas furnaces and water heaters, must either be sealed combustion, power-vented or installed outside the conditioned spaces. Do not install unvented fireplaces.
- Install one hardwired carbon-monoxide detector per 1,000 square feet of living space (minimum one per floor) in all houses where there is an attached garage or any combustion appliance is used in the structure.
- Common walls to the garage need to be properly air-sealed, and doors to garages need to be weather-stripped.

Radon and Pest Resistance

- Install a radon-mitigation system that depressurizes the slab, and properly air seal.
- Perform a radon test before moving in. For more information, visit www.epa.gov/radon.
- Consider nontoxic borate treatment or bait/monitoring systems for termite control.



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- Install termite flashings that provide a physical barrier between the foundation and the wood structure.

Materials

- Use formaldehyde-free insulation and building materials wherever possible.
- Use low-VOC (volatile organic compound) paints.
- Use low-VOC stains and finishes on all wood work.
- Use solvent-free adhesives and glues.
- Don't install carpet. If you do, use a low-VOC carpet rated by the Carpet and Rug Institute.

Sources for this checklist included Advanced Energy System Vision Guidelines, Southface Energy Institute Technical Bulletins, HealthyBuilt Homes program guidelines and Energy Star guidelines for homes and indoor quality.



ENERGY SAVING TIP

Properly insulate attics and roofs

Heat rises. If there isn't enough insulation in the space above your house, your money is literally going out the roof. Most ceilings or attic spaces should have about 10 inches of insulation.

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Checklist: HVAC

by Maggie Leslie

A home can be heated or cooled using electricity, gas, geothermal energy, solar energy or a combination of energy sources. Radiant floor-heating systems are an inherently efficient way to heat, since there is no heat lost through ductwork, but a forced-air heating system can also be a very efficient option if designed and installed properly. The items on this checklist should be considered when installing any type of ducted system.

First off, a room-by-room heat-loss/heat-gain calculation must be completed. Maximum-oversizing limit for air conditioners and heat pumps is 15 percent. Adhering to the maximum-oversizing limit both ensures that you are not paying for more capacity than you need, and that the system will properly dehumidify the home and run efficiently.

- Heat pumps and air conditioners must have a Seasonal Energy Efficiency Ratio rating of at least 14 SEER and a Heating Season Performance Factor of at least 7. Gas furnaces used for either primary heat or backup heat should have a rating of at least 90 Annual Fuel Utilization Efficiency.

- Locate ductwork and the mechanical unit in the conditioned space, if possible. All ductwork should have an insulating value of R-8.

- 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 should be sealed with duct mastic and fiberglass mesh; this includes duct connection to metal boots (in subfloor), trunk lines and air-handler units. Insulating liner of ducts must also be sealed with mastic.

- Indoor and outdoor HVAC units must be matched according to the Air-Conditioning & Refrigeration Institute Directory or the manufacturer's listing.

- Verify that the correct charge of refrigerant has been installed per the manufacturer's specifications.

- Registers and diffusers must have proper throw and spread to keep rooms properly conditioned.

BOOT AND DUCT CONNECTION HIGHLIGHTS

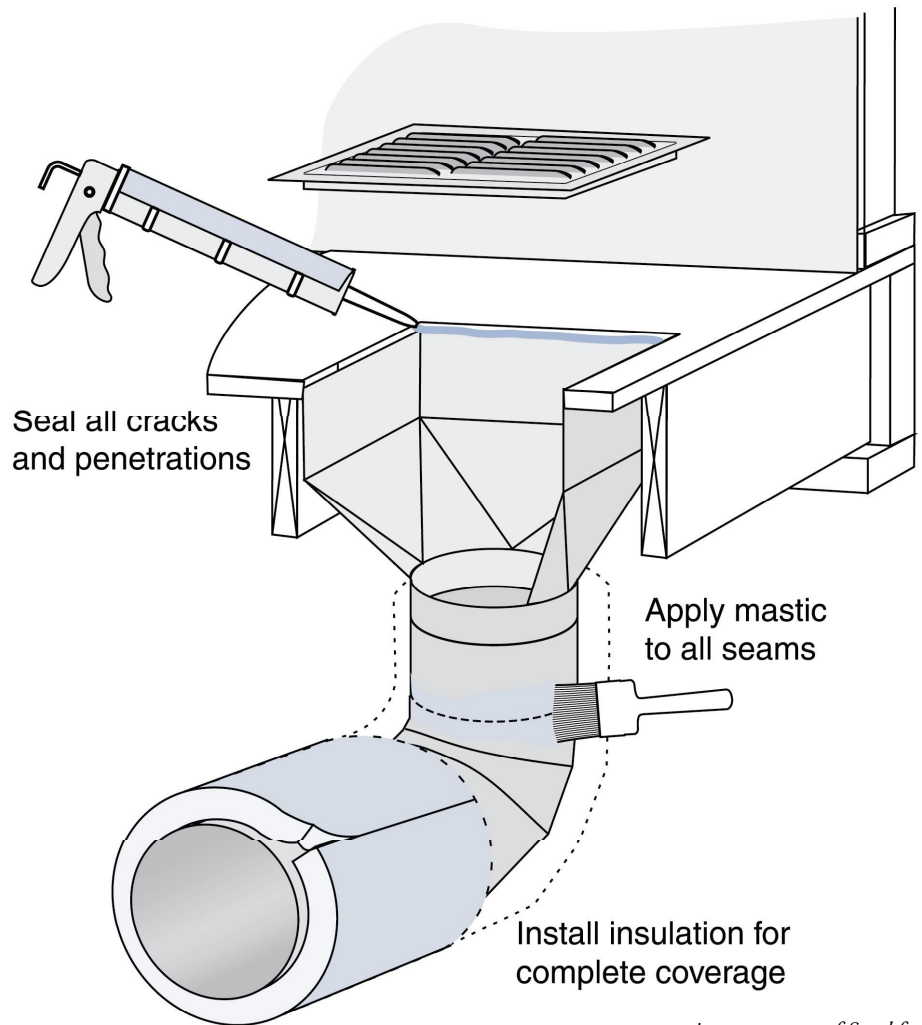


image courtesy of Southface

- Duct dampers should be installed and accessible on supply vents. The dampers make it possible to adjust the flow and spread of air from the registers.
- Ducts should be sealed and tested by a home energy rater to have no more than 5 percent leakage.
- If you are installing a heat pump, make sure to install an outdoor thermostat to control when the electric heat strip's power is on. This will maximize your efficiency.
- Install a programmable thermostat.

Sources for this checklist included Advanced Energy System Vision Guidelines, Southface Energy Institute Technical Bulletins, HealthyBuilt Homes program guidelines and Energy Star guidelines for homes and indoor quality.

Checklist: Insulation

by Maggie Leslie

There are many types of insulation. The most common type is batt, or blanket-type insulation (typically fiberglass). This is the least expensive, but requires careful installation to ensure 100 percent coverage. Blown types, such as fiberglass, cellulose (made from recycled newspaper) and foams are more easily installed and do a good job at filling in gaps, cracks and areas around pipes and wiring. Foams have an added benefit: They air seal all the gaps and cracks in the walls for more of an airtight outcome. Below is an insulation checklist.

- Insulation should be installed to be in full contact with the air barrier (the Sheetrock to the inside and the sheathing to the outside) to provide continuous alignment of the insulation with the air barrier.
- Insulation should be installed to fill 100 percent of every cavity.
- Insulation should be cut to fit around all plumbing, heating, electrical penetrations and other obstacles. This should fill all cavity spaces and gaps, while *not* compressing the insulation.
- If batts are used, they should be split to go behind and in front of wires and plumbing.
- 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 to the exterior edge of the top plate of the wall below. Roof-framing details, such as raised-heel trusses or oversized trusses, must allow for this.
- Insulation baffles or other air barrier should be installed to prevent overblow 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 subfloor above. Floor insulation shall be installed so as to provide continuous coverage, with no compression of the insulation and with no gaps. Batt insulation must be cut to 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 instead of plywood or oriented strand board as a spacer, 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 2-by-10s).
- Ladder “T-walls” should be used at partition connections on exterior 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 use 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.

Sources for this checklist included *Advanced Energy System Vision Guidelines*, *Southface Energy Institute Technical Bulletins*, *HealthyBuilt Homes program guidelines* and *Energy Star guidelines for homes and indoor quality*.

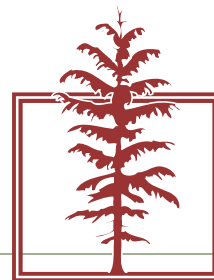
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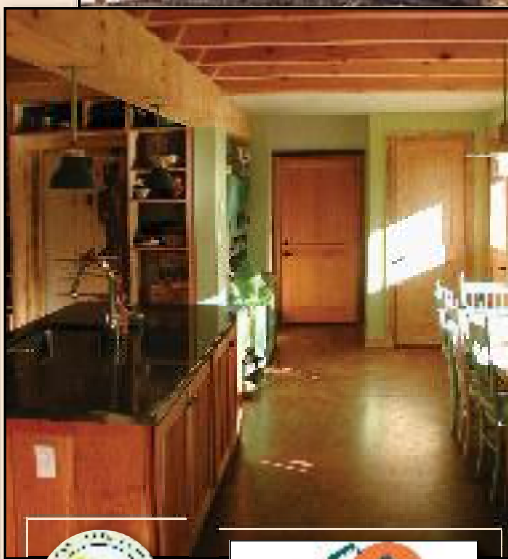
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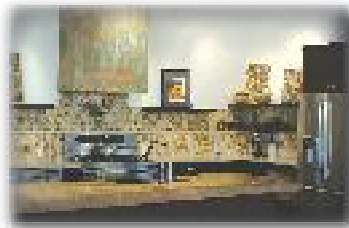


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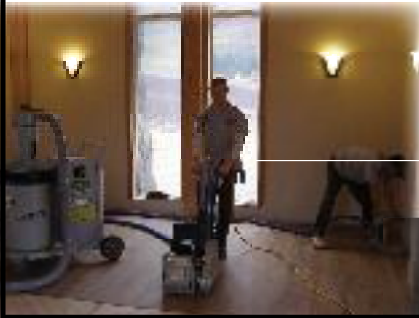


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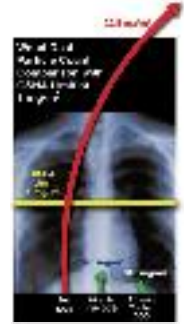


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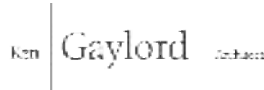
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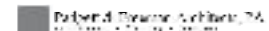
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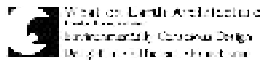


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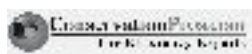
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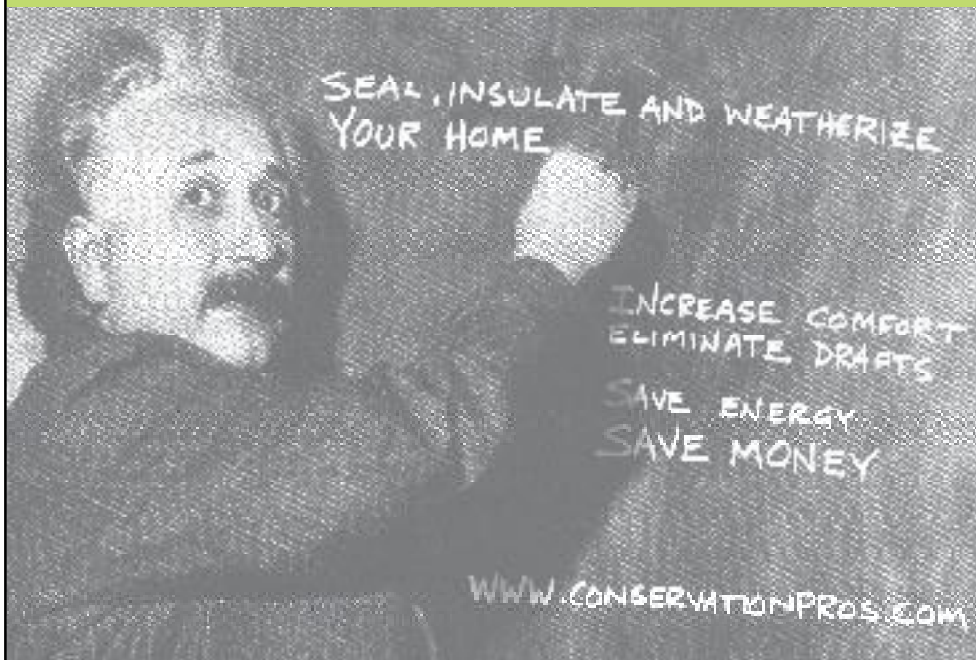


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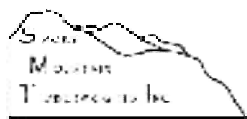
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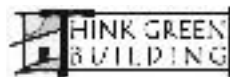


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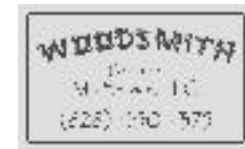


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On the cover:

A green home in Fairview designed by architect Greg McGuffey of Earthtone Builders. Pictured are Rob Greene and his dog, Zeb.

(photo by Jonathan Welch)



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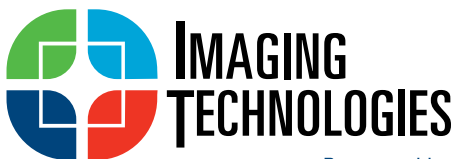


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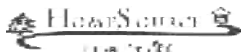
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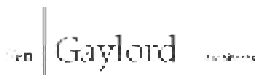
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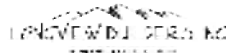
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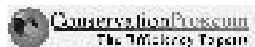
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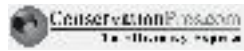
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» WNC Green Building Council supports sustainable design

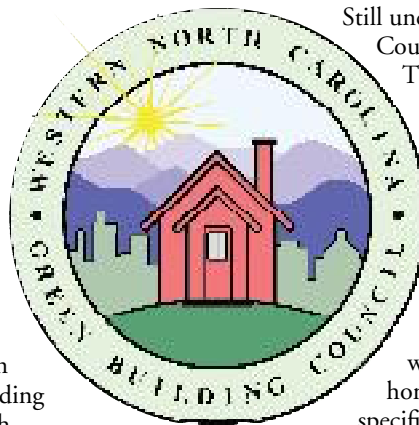
The built environment is an energy hog. The Environmental Protection Agency has estimated that 68 percent of electricity consumption, 30 percent of landfill waste and 38 percent of carbon-dioxide emissions in this country can be attributed to buildings. Lumber used in new construction may originate from dramatic clear-cuts that ravage forest habitats. Stormwater and erosion problems linked with construction sites can degrade streams. And some products installed in building interiors can give off harmful airborne chemicals, threatening people's health.

Fortunately, a growing number of building professionals in Western North Carolina are bucking the trend of high-impact construction. Attuned to the importance of improving air quality, addressing climate change and protecting the region's pristine mountains and lush forests, the Western North Carolina Green Building Council is working to set a new standard for development. The group has dedicated the past eight years to teaching others how to lessen their environmental impact through green building — and the message seems to be getting through.

The WNC Green Building Council's membership has tripled since the last directory was published, leaping from 150 members in early 2006 to 450 at the beginning of 2008. Meanwhile, an ever-growing number of builders have opted to register with N.C. HealthyBuilt Homes, a statewide green-building certification program that the WNC Green Building Council had a hand in establishing in 2004. When the 2006 Green Building Directory was published, it was reported that the local HealthyBuilt Homes branch had certified 19 homes in the area, and was anticipating 60 more in 2006. Now at the beginning of 2008, the numbers are considerably higher: 100 homes have been certified, and 492 are in the works. And the number of commercial buildings in WNC that have registered with the national Leadership in Energy and Environmental Design

program, a more stringent standard for low-impact commercial design, has risen to 15, up from just a handful in 2006.

Green building has caught on so well that even local governments are now willing to lend a helping hand to homebuilders who are considering environmental design. The city of Asheville offers a number of financial incentives for green-design features, including \$100 for obtaining an Energy Star rating, \$200 for obtaining a HealthyBuilt Home certification, and \$50 per installation of a geothermal system, a solar-panel array, a wind generator or a water-collection device. The town of Black Mountain has agreed to provide a \$500 rebate to any construction project that achieves a bronze certification in the HealthyBuilt Homes program or any certification level in the LEED rating system.



Still uncertain where to start? The WNC Green Building Council — and this directory — have got you covered.

The council periodically leads green-home tours to provide builders and prospective homeowners with concrete examples of how to implement sustainable design. A series of workshops, the Green Building 101 Series, provides information on everything from choosing the right renewable-energy system to enhancing indoor-air quality, and is offered by the council on a regular basis (visit www.wncgbc.org for the schedule). The council's Web site also supplies a wealth of information, including a listing of green homes on the market and a pile of resources for specific aspects of green design. Call the WNC Green Building Council hotline at (828) 254-1995, free of charge, to get answers to green-building questions or referrals for local green-building professionals.

Green building, or sustainable design, means implementing practices that use energy, water and materials more efficiently, and that have a gentler impact on human health and the environment over the entire life cycle of the building. The growth and development of our communities impacts not only our natural surroundings, but our overall quality of life. Use this directory and the guidance of the WNC Green Building Council to reduce your impact, and to incorporate social and environmental responsibility into your design. ■

— Rebecca Bowe

Support the work of the WNC Green Building Council by becoming a member today!

Your tax-deductible donation helps support promotion of green building through:

- The HealthyBuilt Homes green home certification program
- Helping local governments and schools transition to greener policies and operations
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- Development of models of green affordable housing
- The distribution of the WNC Green Building Directory
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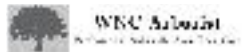
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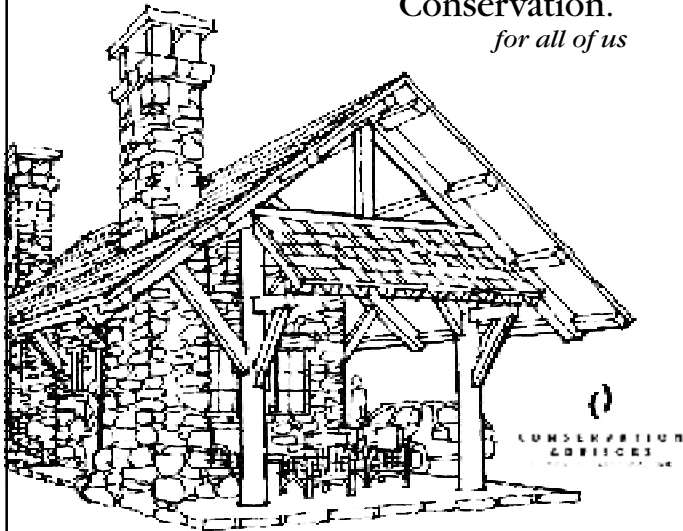
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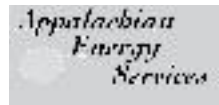
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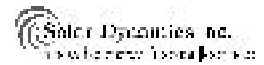
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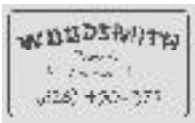
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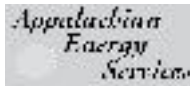
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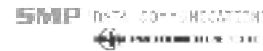
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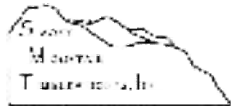
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Renewable Energy Access is a widely recognized source for renewable energy news and information on the Internet. (www.renewableenergyaccess.com/rea/home)

The Source for Renewable Energy is a comprehensive online buyer's guide and business directory to more than 9,000 renewable energy businesses and organizations worldwide. (<http://energy.sourceguides.com/index.shtml>)

Solar Energy International (SEI) offers hands-on workshops in solar, wind and water power and natural building technologies in 11 locations. (www.solarenergy.org)

Passive Solar Energy 1 is a PDF file with good passive solar information. (www.illinoisolar.org)

Hydro Power

Low Impact Hydropower Institute is a nonprofit dedicated to reducing impacts of hydropower generation through the certification of environmentally responsible hydropower. (www.lowimpacthydro.org)

Wind Power

ASU Small Wind Initiative is Appalachian State University's local wind-energy information and demonstration center, including an anemometer loan program and hands-on workshops. (www.wind.appstate.edu)

American Wind Energy Association has advocated the development of wind energy as a reliable, environmentally superior energy alternative in the United States and around the world since 1974. (www.awea.org)

Energy-Efficient Appliances

American Council for an Energy-Efficient Economy provides information

on the long-term energy costs of appliances, tax incentives and directories of manufacturers. (www.aceee.org/consumerguide/mostenef.htm)

Energy Star Appliances

includes lists of all Energy Star certified appliances and products. (www.energystar.gov)

Lighting

Department of Energy: Energy Efficiency and Renewable Energy is an informational site on different types of energy-efficient lighting. (www.eere.energy.gov/EE/buildings_lighting.html)

Windows

Efficient Windows Collaboration is a database of efficiency initiatives, including tax incentives, building-code changes and legislative initiatives. It provides unbiased information on the benefits of energy-efficient windows, descriptions of how they work and recommendations for their selection and use. (www.efficientwindows.org)

Green Building Materials

AIA Sustainable Design Resource Guide is a guide to help architects identify and specify green materials. (www.aiasdrg.org/sdrg.aspx)

Ecology Action's Green Building Material Guide is a comprehensive list of green-building related materials and systems. (www.ecoact.org/Programs/Green_Building/green_Materials/)

GreenSpec is BuildingGreen's product information service. It contains detailed listings for more than 1,800 environmentally preferable building products with descriptions, manufacturer information and links to additional resources. (www.greenspec.com)

The Green Building Resource Guide is a database of more than 600 green-building materials and products selected specifically for their usefulness to the design and building professions, rather than merely their green-material content. (www.greenguide.com)

Greener Building is a site with personal

expertise on products by the sustainable building community. It is a site dedicated to personal contributions about products and technologies, as well as your personal wisdom about building in your area. (www.greenerbuilding.org)

Glossary of Green Building Terms is a glossary that helps you to articulate sustainable and green-building concepts commonly used in residential construction. (www.greenbuildingcookbook.info/Glossary.html)

The Massachusetts Technology Collaborative site holds definitions of terms relating to energy-efficient technologies and elements of green buildings. (www.mtpc.org/cleanenergy/energy/glossaryefficiency.htm)

Government Resources

Building Technology Center: Oak Ridge National Laboratory is the premier U.S. research facility devoted to the development of technologies that improve the energy efficiency and environmental compatibility of residential and commercial buildings. (www.ornl.gov/sci/btc/)

Energy Information Portal is a DOE Web site containing links to online documents about energy efficiency and renewable energy. (www.eere.energy.gov)

ENERGY STAR is a government-backed program helping businesses and individuals protect the environment through energy efficiency. (www.energystar.gov)

Indoor Air Quality

U.S. EPA gives information relating to mold, air quality and asthma, and tips for handling mold in your home. (www.epa.gov/mold/moldresources.html)

U.S. EPA provides this site as a guide about indoor air quality. (www.epa.gov/iaq/pubs/insidest.html)

Mold1.net is a mold resource Web site giving more mold links. (<http://ga.mold1.net/>)

California Indoor Air Quality (IAQ) Program conducts and promotes the coordination of research, investigations, experiments, demonstrations, surveys and studies relating to the causes, effects, extent, prevention and control of indoor pollution. (www.cal-iaq.org/)

The American Indoor Air Quality Council promotes awareness, education and certification in the field of indoor air quality. (www.indoor-air-quality.org)

Smart Growth

Smart Growth Network was formed by the U.S. EPA and several nonprofit and government organizations in 1996 to seek out new ways to grow that boost the economy, protect the environment, and enhance community vitality. (www.smartgrowth.org/default.asp)

Smart Growth America is a coalition of national, state and local organizations working to improve the ways we plan and build the towns, cities and metro areas we call home. (www.smartgrowthamerica.com)

The National Center for Smart Growth Research and Education is a nonpartisan center for research and leadership training on Smart Growth and related land-use issues nationally and internationally. (www.smartgrowth.umd.edu)

Sustainable Site Planning

The Smart Communities Network offers great resources, tools, links to articles, publications and community success stories on a variety of topics from community energy, to green development, to sustainable business. (www.smartcommunities.ncat.org)

Water Conservation

Earth 911's Water Conservation Tips is a complete list of ways to save water in the home by room and also provides additional resources. (earth911.org/water/water-conservation/)

Texas A&M Rainwater Harvesting Guide to rainwater harvesting, management and reuse. (rainwaterharvesting.tamu.edu)

American Rainwater Catchment Systems Association helps to disseminate information about utilizing rainwater for outdoor and indoor uses, and is a resource for finding installers and workshops on rainwater collection. (www.arcsa.org)

Financial Incentives

Database of State Incentives for Renewable Energy offers information on

state and federal tax incentives for solar electric and other renewables, alternative-fuel vehicles and energy conservation. (www.dsireusa.org)

Tax Incentive Assistance Project is designed to give the latest information on federal income-tax incentives for energy efficiency with buildings and vehicles. (www.energytaxincentives.org)

Green Building Groups

The U.S. Green Building Council is the nation's foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. USGBC administers the LEED certification programs. (www.usgbc.org)

North Carolina Sustainable Energy Association is a nonprofit association that works to create a sustainable energy future in the state through the promotion of renewable energy technologies and energy efficiency. (www.ncsustainableenergy.org)

North Carolina Solar Center serves as a clearinghouse for solar and other renewable energy programs, information, research, technical assistance and training for the residents of the state and beyond. (www.ncsc.ncsu.edu)

Energy and Environmental Building Association (EEBA) was formed to provide education and resources to transform the residential design, development and construction industries to profitably deliver energy efficiency and environmentally responsible buildings and communities. (www.eeba.org)

PATH: Public Private Partnership for Advancing Housing Technology is dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, environmental performance and affordability of America's housing. (www.pathnet.org)

Local Resources

Sustainable WNC is a Web portal for businesses, nonprofits, citizens and local governments working to promote the principles and practices of sustainability in Western North Carolina. (www.sustainablewnc.org)

Sustainable Asheville promotes sustainability in our community through education and networking. SA provides opportunities to share insights and creative solutions for living interdependently within our local and global ecosystems. (www.sustainableasheville.org)

Southern Energy and Environment Expo is an annual event designed to showcase renewable energy and sustainable economics in a context of responsible environmental stewardship. (www.seexpo.com)

Publications

Environmental Building News is a monthly newsletter published since 1992 featuring comprehensive, practical information on a range of topics related to sustainable design in the built environment. (www.buildinggreen.com/articles/index.cfm)

"Good Energy at the Good Life Center" is an article about the Good Life Center created by Scott and Helen Nearing. (www.goodlife.org/glc_news.html)

Home Power Magazine offers comprehensive coverage of solar, wind and microhydro electricity, home energy efficiency, solar hot-water systems, space heating and cooling, green building materials and home design, efficient transportation and more. (www.homepower.com)

Environmental Design and Construction Magazine is a bimonthly magazine reporting on the innovative products, strategies and technologies that are driving the green building industry's success. (www.edcmag.com)

World Changing is an online source for news on sustainable efforts. (<http://worldchanging.com>)

For a complete and updated list of green building resources, visit the resources list at www.wncgbc.org.

Learn the lingo

» Frequently asked questions to help you find the real (green) deal
by Maggie Leslie and Rebecca Bowe

Kermit the Frog's famous line, "It's not easy being green," may still hold true today. But some developers or manufacturers who want to take advantage of a growing demand for environmentally friendly products have learned that it *is* easy to label something as green, even if they haven't gone the extra mile to conserve resources. This trend, often called "greenwashing," can make it more difficult for consumers to sort out the truly eco-friendly options from the rest. The Q-and-A that follows sheds some light on how to find products and building materials that live up to healthier standards.

If I'm going to shell out top dollar for a green product, I want to make sure the manufacturers are as obsessive as I am about going easy on the planet. How will I know it's not some pretender who only cares about the other kind of green?

The Environmental Building News' Greenspec® product directory breaks products down into a few basic categories: products made with salvaged, recycled or agricultural waste; products that conserve natural resources; products that avoid toxic or other emissions; products that save energy or water; and products that contribute to a safe, healthy built environment.

Also, consider locally manufactured, fair-trade, carbon-neutral and minimally packaged products. Finally, try to choose durable materials: If you build the greenest home possible and it has to be abandoned due to moisture problems, then you'll only end up feeding the landfill in the end. Weighing these criteria against a product will help determine the product's true costs and benefits.

As an ultra-greenie, I want to incorporate into my home décor some materials that might have otherwise gone to waste. Any advice?



Clockwise, from top: Paperstone, marmoleum, recycled tile, lcestone, eco-resin, kirei and bamboo. These green and recycled products, and more, are available at Build It Naturally in downtown Asheville. *photo by Jonathan Welch*

Salvaged flooring, as an example, is beautiful. Plus, it adds character to a home that new materials cannot. Also, think about using products that reduce the need for additional materials — for example, concrete floors can be stained to look very attractive, ■■■►

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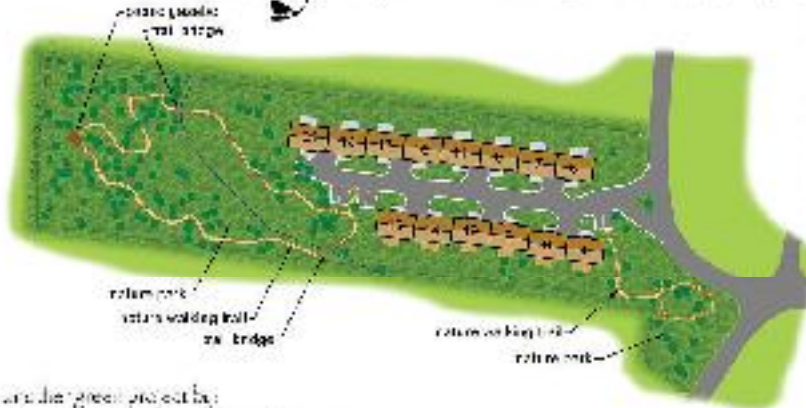
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