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Case study: A little solar with your coffee

Green Sage Coffeehouse & Café

by Margaret Williams

Look on the sunny side: The rooftop solar panels at Green Sage Coffeehouse & Café power the restaurant's hot-water system. *photos by Jonathan Welch*

It's no surprise that Randy Talley runs a "green" coffeehouse that sports solar panels on its roof. Back "before it was cool" (and he was 18), says the entrepreneur, he got hooked on healthy foods and thought he wanted to be an organic farmer. Talley went so far as to attend the progressive and organic-minded Evergreen State College in Olympia, Wash. But to earn a living, he worked in some of the country's first health-food stores: the Puget Consumer Cooperatives in the Pacific Northwest and Wellspring Grocery in the Raleigh-Durham area.

His health-food-grocer career evolved into more entrepreneurial roles: helping create two health-food stores in North Carolina (Weaver Street near Chapel Hill and Talley's Green Grocery in Charlotte). And in Asheville, Talley took part in transforming the natural-foods grocery Dinner for the Earth into Earth Fare, and he also consulted for Greenlife.

Next on the list for the 49-year-old, self-described "reluctant businessman" was a coffeehouse — but not just any ol' coffeehouse. With partner Al Kirchner, Talley stepped up his desire "to get involved in green ventures." The common thread in his business-career choices, he explains, has been a little something he calls "green-mindedness." The pair set their sights on creating "a model green restaurant" — one that provided natural-food choices and operated with environmentally friendly, sustainable principles, says Talley.

As Kirchner and Talley formed Sage Enterprises, LLC, they considered buying an existing coffeehouse and "greening" it, but the first part of their equation was location, location, location. When the site of Asheville's seminal (and decidedly quirky) coffeehouse, Beanstreets, became available, Talley and Kirchner took it on. A post-Beanstreets restaurant that took over the space — C.F. Chan's — had remodeled much of the space, but Sage Enterprises went further.

Plexiglass dividers at the kitchen counter and between levels at the coffeehouse are made out of recycled plastic bottles; in between the translucent layers are real gingko leaves. The concrete countertops are composed of 75 percent-recycled material from Buncombe County (and created by the Asheville-based Mandala Design). Cabinetry comes from reclaimed rafters out of a Montford house. The low-VOC paints come from a local company, Earthpaint, says Talley, mentioning how many of these choices were made easier by another local company, Build It Naturally.

As for Green Sage's coffeehouse fare, all the teas and coffees are fair-trade. The food is local and/or organic, such as the burgers made with meat from the Leicester-based Carolina Bison. For to-go orders, the coffeehouse eschews plates and silverware for compostable products supplied by a local company, Jack's Boxes. The restaurant also

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prominently features a recycling and composting station that's practical as well as educational (signs remind diners that napkins go with the compostable food trash; newspapers get their own bin). The compost-and-recycle system makes Green Sage a bit unique among restaurants: It doesn't have a big garbage bin out back.

And, of course, there's the solar-energy system.

"When Progress Energy [proposed building] a coal-fired power plant in Woodfin [in 2007], I made a decision. We've got to change things," says Talley. He started at home, making three different trips to the hardware store so he could replace all his incandescent bulbs with compact fluorescent bulbs ("I couldn't believe how many light bulbs there were in my house," says Talley about the multiple trips.) About the same time, his home-heating system failed, and the local solar-energy company, FLS Energy, helped him come up with a method that combined what he calls a "new-fangled natural-gas heat pump" and solar panels; working in conjunction with the heat pump, water is pre-heated by energy from the panels, Talley explains.

Most importantly, the project showed him how tax credits worked for solar-energy installations — and how to get the most from them.

He got FLS to evaluate how he could install a solar system at Green Sage. Talley wasn't interested in hiding the rooftop solar array — part of the idea is to put the system on display so other businesses might be encouraged to go solar, he emphasizes. But there was one dilemma to be solved. "When you realize the implications of doing a large-scale solar water-heating system, you have to have water storage," says Talley. And part of the equation in any green project is taking into account the economic, ecologic and sociologic implications of *everything* you do, he continues.

To avoid taking up main-floor space at the coffeehouse, the FLS team considered installing a 480-gallon storage tank in the basement. A single tank would have been the most efficient, says Talley, but technical problems with the proposal led to the installation of six 80-gallon tanks instead. It was a challenge to make sure there was enough hot water storage to meet all the coffeehouse needs — "such as cleaning dishes, which we do a lot of," says Talley. Installing six smaller tanks instead of one larger unit was "what we had to do," he states.

Such decisions go hand-in-hand with his overall philosophy for a green business. He had a whole-house water filter installed, offering customers drinking water that doesn't come in the environmentally problematic, but prevalent, plastic water bottles (Green Sage sells stainless-steel bottles customers can fill on-site). The men's bathroom features a waterless urinal, which can save 40,000 gallons of water per year. "I wanted to make sure this wasn't a fake green business or a 'greenwash,'" says Talley. "With 'green' in our name, we didn't cut any corners." And while it's true that Talley remains optimistic about Green Sage's business prospects during tough economic times, he's adamant about making a statement when it comes to sustainability. Says Talley, "Asheville sees itself as a green city, but there aren't that many visible signs that it is." But with the prominent solar panels on Green Sage's roof and other businesses and homeowners doing the same, perhaps that will change.

The changing skyline: Green Sage owner Richard Talley hopes these solar panels will entice others to try the technology.

As Talley notes, it's all part of changing our habits and taking notice. Local officials, for example, didn't realize the panels hadn't been inspected until they looked up and saw them on the roof. An inspection preceded forthwith — along with a chance for Talley to spread the word and make it easier for the next business owner or homeowner to negotiate the process of going green.

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Case study: Cherokee school takes the LEED

The Eastern Band's new & green K-12 campus

by Margaret Williams

Let there be natural light: Kids learn better in well-lit classrooms, and the windows at Cherokee let the sunshine in. *photo by Jonathan Welch*

When the WNC Green Building Council first got involved with the new school being built in Cherokee, it was little more than a concept: Create a K-12 facility that would incorporate green-building principles as well as cultural elements important to the Eastern Band of Cherokee.

The Cherokee Central School Campus is near completion. By September 2009, Cherokee children and youth will fill its halls, enjoy the comfort of geothermal heating/cooling, admire stonework laid by native craftsmen, flush toilets filled with harvested rainwater, and study the native plants that will be featured in much of the landscaping.

It's one of the largest "green" schools east of the Mississippi, by most counts. The Cherokee campus encompasses almost 500,000 square feet of school buildings for its elementary, middle- and high-school students. It includes almost 11,000 square feet of dining space (separated by school groups), a shared 7,750 square-foot kitchen, four gymnasiums, a stickball field for the traditional Cherokee sport, football and baseball fields, a track and generous open spaces on its 50-acre site near the Blue Ridge Parkway and the Great Smoky Mountains National Park.

In technical terms, project leaders and designers are aiming for a silver certification from the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) program, says Maggie Carnevale, an architect at Padgett and Freeman Architects, the local firm overseeing the project. She explains that silver is the third-highest certification, which will be an exceptional achievement for a project of such a grand scale. An initial review for the LEED certification process has been completed, rewarding the project 22 points out of 33 needed for a silver certification, Carnevale adds. The remaining points will be reviewed once construction is complete.

One of the first approaches to LEED certification means considering how the structure lies on the land, Carnevale observes. Every effort was made to maintain views of the mountains, respect existing wetlands, situate buildings in relation to natural topography and use floodplain areas for such components as the ball fields and parking, she continues.

Seen from high above, the new school might remind you of the outline of the Big Dipper — a short handle with two circles at the end. Zoom in, and you see the rings are actually two-story buildings encircling impressive, one-acre courtyards, and the handle holds a stadium and sports arena. The rooflines slope, curve and swell like the surrounding mountains; landscaped walkways wind between stone-trimmed buildings; windows soar skyward at entrances.

Another exterior feature, built into the stucco walls, are designs that mimic traditional Cherokee basket-weaving designs, such as a pattern called "Noon Day Sun," Carnevale mentions. That's appropriate, because inside the school, the designers have taken advantage of a combination of passive-solar and high-tech methods to get as much natural light into the school as possible, she continues. In the classrooms, sensors will dim or brighten the lights depending on the amount of natural light entering the space. The type of windows installed and the

shading vary according to a building's orientation to the sun. On west facades, for example, "you don't want so much light entering because that overheats [the room], particularly in the summer, so you install more shading to deflect the light," Carnevale says. She also mentions the use of solar tunnels that bring light to interior rooms, classrooms and gymnasiums.

Researchers with the Heshong-Mahone Group for Pacific Gas & Electric report that student performance can be enhanced 7 to 18 percent when a classroom is well lit with daylight. To that end, the high-tech sensors, the passive-solar approach and windows with the appropriate characteristics per orientation will be complemented by such things as reflective painted ceilings that will disperse natural light more deeply into the classrooms.

The overview: From the enviro-friendly turf of the football field (bottom left), to the roundup of classroom buildings (center left) to the ball fields, every effort has been made to create a school that demonstrates green-building principles. *photo courtesy of Padgett & Freeman Architects*

Then there's water conservation at the new school. Some of its toilets will flush with water stored in two 30,000-gallon cisterns that will harvest rainwater off the surrounding roofs. That water will also supply the school's landscaping irrigation, which incorporates conservation methods such as rain gardens and permeable parking areas, as well as native plants important to Cherokee culture, such as river cane for basket-making, and traditional herbs and plants used for dye, says Carmaleta Monteith, school design coordinator for the tribe's Central Schools Board. A semi-retired school administrator and Cherokee native, she emphasizes that the school will integrate its green features with cultural and environmental education. "One of the most exciting parts, for me, is not just to save resources and protect the environment, but to teach the students about [green issues] while they're experiencing it," says Monteith.

From that point of view, it's very appropriate that the large multigrade school will use an earth-based heating-and-cooling system: Almost 300 wells have been dug to 450-feet depths to pump water in a closed-loop geothermal system. Although the school is about 40 percent larger than Cherokee's two existing schools and facilities, the energy savings from this system and other green-building methods is expected to be substantial, says Carnevale. Despite the greatly enlarged new campus, the anticipated energy cost per year is expected to result in a 50 percent savings over the current energy cost of the existing facilities.

The geothermal nexus: The Cherokee Central School campus is heated and cooled by a geothermal system that draws on the earth-power of about 300 wells. *photo by Jonathan Welch*

Part of that equation meant incorporating SIPs — structural insulated panels — into the exterior walls and in roof construction. The SIPs are 8.25 inches thick for the walls, 10.25 inches for the roof, Carnevale reports. That's an effective R-value for the SIP walls of R-28.6 and the roof of R-36.1.

The project also boasts another kind of savings: More than 90 percent of the construction waste incurred has been or is being recycled. Brush and small trees, for example, were mulched during site preparation and kept on-site to use in landscaping. Timber felled from clearing the site is being used for interior woodwork, which features about 96,000 board feet of walnut, cherry, sycamore, white oak, red oak, pine, poplar and other trees.

Then there are the floors. Many public institutions use VCT (vinyl composition tiles). "But we had the idea of using ground-and-polished concrete floors," says Carnevale. Compared to VCT, such concrete flooring requires less maintenance and doesn't exude the chemicals typically used in regular waxing and polishing maintenance. Other flooring choices include environmentally friendly carpet, cork flooring, and true linoleum, which is made of naturally antimicrobial linseed oil and wood (or cork) pulp.

A few other features of the new school include plans for a greenway that connects it to town, high-tech stations for students to balance cultural and traditional education with state-of-the-art components, shared and linked spaces, and even school buses that run on biodiesel (already in use). Monteith insists that it's all a crucial part of creating a new school. She says, "We have to do the best job we can, not just for now, but for the future."

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Case study: This old greener house

Balancing affordability with sustainability

by Margaret Williams

Patience, research and balance: Those are some of the ingredients for successfully renovating an older house within a "green" philosophy. Matt Siegel has followed these notions in the ongoing green renovation of his family's West Asheville cottage. Director of the WNC Green Building Council, he remarks, "You could spend thousands and thousands of dollars, [or] you can balance affordability with sustainable choices."

In the kitchen, for example, he considered replacing the old countertops with new, recycled-content products that cost upward of $50 a square foot — ones made of recycled paper and recycled glass. "It would have cost a $1,000 for our countertop," says Siegel. In 2006, he had written that one of the best ways to follow the tenets of green building is "simply to reuse the materials that are already here." Sometimes, that means looking for options close to home instead of going out and buying something new. So Siegel did a little extra legwork and learned that a local business had donated some laminate countertops to the Habitat for Humanity Home Store near downtown. He bought one of those countertops for about $30 — a fraction of what he would have spent on the latest recycled-product ones.

For a more decorative effect on another countertop area, Siegel also snagged a salvaged section of a bowling-alley lane. For a mere $10 a linear foot, he procured a 2-inch thick, solid maple countertop for a side area of the kitchen. The piece is complete with bowling-lane arrows and dots; it tops off an old chimney that Siegel had partially dismantled in order to open up what had been a narrow entryway between the kitchen and the dining room.

A few years ago, he detailed these and other renovations in the home, which was built in the 1920s and inhabited by one family since its construction. The West Asheville house totals about 1,100 square feet, has a partially finished basement and a small yard.

Some of his first green projects were inexpensive: He spent $4 for a new showerhead, $1 on a faucet aerator and $20 on a rain barrel. Siegel later checked to see how his water usage had changed since making these inexpensive changes: His water bill was reduced by about $6 per month. That doesn't sound like a lot, but it translates into a reduction of 600 gallons a month, Siegel points out.

In another round of inexpensive improvements, he installed a $30 programmable thermostat for the heating system, switched the lights to compact fluorescent bulbs at $2 each, and spent $25 and a few hours' effort on weatherization (caulking and weather stripping, for example). With heating costs adding upward of 80 percent of his total energy use for the house, these and other simple steps are well worth the few hours' work they take, Siegel emphasizes. He also ran a blower-door test to identify where heat and air leak out. Siegel learned that the cottage was almost 60 percent leakier than the maximum allowed for a HealthyBuilt house. "Air sealing is one of the most important, quick-payback things you can do to increase your energy efficiency," Siegel explains. The inexpensive weather stripping and caulking improved the air/heat loss by 20 percent, he reports.

A little luck helped, too. Early in the renovation, for example, he

discovered that the walls had been insulated when vinyl siding was installed on the home exterior. So Siegel borrowed a blower machine from Lowe's and blew 25 bags of cellulose insulation — purchased for the walls — into the attic ($7 per bag).

Most recently, Siegel tackled a tougher insulation project: the floor. Typical for a period house, the oak flooring was installed over slats; cold air and mold from the unheated basement were persistent problems. He needed to insulate and to air seal. But the typical fiberglass insulation is problematic for placing under floors; it tends to fall down, and it doesn't seal all the air gaps. "If it's not effective, it doesn't matter how cheap it is," Siegel says.

For about $1.70 per square foot, he had spray foam insulation installed under the floor. The results were another 7 percent improvement in the blower-test results. According to a study of 100 homes in North Carolina — done by Advanced Energy — air leakage (infiltration and exfiltration) accounts for up to 40 percent of the heating and cooling bills of most homes.

In addition to interior work, Siegel has taken sustainable approaches outside, too.

In looking to create better access from the house to the backyard, Siegel installed an exterior door at the kitchen and built a deck and stairway. "The greenest deck is no deck at all," he says. But to create access, Siegel had to be pragmatic, because it's about a 10-foot drop from the rear main level of the house to the yard below. As he did for the kitchen countertops, Siegel did extra research and legwork. He had to use pressure-treated wood for the main structure of the deck.

But for the deck itself, Siegel first reviewed a chart detailing the recycled content of various decking materials. Then he sent letters out to local building-material suppliers, asking who could supply the materials with the highest level of recycled content. The result? The deck flooring is a product called RhinoDek, which contains 50 percent post-consumer recycled plastic. Siegel also tracked down a third supplier, WNC Surplus, which provided reclaimed pickets.

"It took more time and effort, but [overall], it wound up being cheaper than if I'd gone to [a home-improvement] store and ordered my deck," says Siegel.

He took a similar keep-it-local approach for other outdoor projects. Most of the fence materials came from a local sawmill and feature locust posts and hemlock pickets. A tile mosaic on the wall of the garage came from reclaimed broken tile from a local store. (As for the roof of an old garage, Siegel hasn't gotten around to that project yet; the old roof is green, however, because it's covered with moss.) In other outdoor efforts, he used the bricks from the dismantled chimney for landscaping projects around the yard.

Siegel also recently planted trees that will grow into a good windbreak for one side of the house. "I wish I had planted them sooner," he admits. Such a simple windbreak can reduce energy use in the home, which is high on the priority list for sustainability.

Another opportunity for reducing energy use comes in choosing appliances, Siegel continues. He points out that his new refrigerator is not an Energy Star model designed to use less electricity. He offers this rationale: Instead of paying more for an Energy Star model, he decided to buy a smaller less expensive refrigerator that met his family needs. Because it is small, it actually uses less energy than a larger, certified model.

Making such decisions has a lot to do with thinking your way through the issues of affordability and sustainability, Siegel argues. When choosing a washer and dryer, for instance, he took into account *how* the family washes clothes. Most energy-efficiency ratings for such appliances are based on hot-water use, he mentions. "We use mainly cold-water washing cycles," says Siegel. When that's taken into account,

Bowling-alley chic: For a fraction of what most countertops cost, homeowner Matt Siegel snagged this piece of all-maple bowling-alley lane. *photo by Jonathan Welch*

it made little sense to buy an expensive front-loader model when a more old-fashioned top-loader would cost less in the long run. To be sure, Siegel is more careful than many folks when it comes to such choices: He measured the kilowatts used in the family's typical five-large-loads-per-week practice. The tally came to 40 kilowatt hours per year. "The savings would have been ridiculously small, if I [bought] a front-loading Energy Star washing machine," says Siegel.

He observes that we often look at getting the latest gadget for saving energy, when the answer has to do more with behavior. "My absolute favorite green building technique is this," he says, pointing to a cord strung across the basement. Clothespins are clipped up and down the cord. "We only use our dryer five to seven times a year," says Siegel.

Considering that appliances are one of the top energy hogs in the typical American home, it's not surprising that Siegel's electric bill for one month in the fall of 2008 was a mere $20. Drying his clothes on the line (outdoors, come warmer weather) saves him more money than many of the more expensive green-building methods, such as installing new windows.

But there is one green effort that was not inexpensive, yet well worth it, Siegel continues. In September 2008, he installed a solar hot-water system. By doing much of the labor himself, he cut the installation costs down to about $6,000 (with contract labor, $7,500 to $8,000 is typical, Siegel estimates). He also received a total of $3,200 in state and federal tax credits.

Solar systems remain one of the most expensive green-building projects homeowners can undertake, Siegel admits. But it adds value to the home and enables homeowners to become more energy self-sufficient.

He emphasizes that individual choices matter, particularly as the trend spreads. "Consumers have the opportunity each time they buy something to make a statement to retailers, manufacturers, builders and others about their priorities," Siegel wrote in the 2006-2007 WNC Green Building Directory. "Green-built homes and materials will become more available if each of us decides to build or renovate in a green way. You can make your home a place you're proud of that reflects your values and even educates people who enter it."

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Case study: A net-zero-energy home

A not-so-big house pays its own way

by Margaret Williams

Here's one mountaintop house that blends in with the stunning view instead of overpowering it: the net-zero-energy home owned by Yves Naar, designed by architect Stephens Smith Farrell and built by Doug Keefer's company, SAGE Builders of WNC Inc.

Solar tilt: Yves Naar's mountaintop perch uses a combination of approaches to achieve net-zero-energy use, including the system powered by these solar panels. *photos by Jonathan Welch*

After a pleasant drive south of Brevard and up a mountain road, the shrub-lined driveway brings you out of the trees and into a space of open sky. Far below, Conestee Lake shimmers in the sunlight. The near 360-degree view encompasses mountains, valleys and sky — and one 1,250-square-foot, flat-roofed house nestled at the edge. The upper level is all you see at first, as much of the home has been set into the mountainside. Approach the house, and you notice both the entryway patio and the roof are covered with hundreds of sedum plants. Both are features installed by a local company called — appropriately — Living Roof Inc. This isn't your average house. Another clue is the lineup of four solar arrays that tilt sunward on a terraced spot to the left of the house.

"The customer wanted the greenest structure he could have," says Keefer. From the site to the furniture, green choices were made at every stage, he explains. There was an existing home, driveway and utility service on the 42-acre site. Other than removing the older house, very little site-prep had to be done, Keefer continues. And Naar decided to build a guest-cottage-size house instead of the all-too-common mountaintop mansion. Smaller is better, because Naar wanted a home that produces as much energy as it consumes: a net-zero-energy house.

To accomplish that goal, the home is heated and cooled by a combination of geothermal and solar thermal systems. Underneath the lower level's slate floor, for example, there's hydronic radiant heat. The solar and geothermal systems preheat the water that runs through the pipes underneath the slab. The real beauty of the system is that Naar doesn't store the electricity generated by the solar system; he sells it. Duke Energy buys Naar's electricity at the wholesale rate of 3 cents per kilowatt, and N.C. Green Power pays an additional 18 cents per kilowatt as a clean-energy credit. The initial idea is to work toward breaking even, Keefer explains. The home has received the second-highest rating in the state for HealthyBuilt Homes, and the Energy Star System has given it the best HERS (Home Energy Rating System) in the state, he adds. Keefer also emphasizes that green building means thinking about more than one aspect, such as the home's heating, cooling and electrical

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systems. Early on, Naar made a commitment to green every component he could. The upstairs floors are reclaimed heart pine, finished with Earthpaint products. Some walls are painted with zero-VOC paints from the same local company; some have been done in a Venetian plaster; others feature such renewable or natural products as bamboo and jute. A bathroom countertop was made by Keefer from reclaimed walnut. The bathroom tiles are made of recycled marble. The kitchen backsplash is made of recycled plastic bottles with stones sandwiched between the layers. Timbers felled from the property support one level of the living roof that extends over the lower-level patio. Part of the exterior is stucco; other sections feature poplar bark siding (complete with the lichen that attaches to old trees).

Even the furniture has a green spin. Several rugs are made from leather recycled from a shoe or purse factory. Two funkadelic chairs are made out of multicolored, recycled cloth scraps. The dining room table was made with reclaimed wood, too.

Inside and out, the house is a lesson in texture.

It's also a very grounded, earthy house. Perhaps that's in part due to the geothermal system. The earth maintains a fairly constant temperature, in the range of 55 degrees or so, Keefer explains. With a little preheating from the solar system, it takes little energy to warm the floor, he continues.

As noted above, most of the lower level recedes into the hillside. It uses a poured-concrete foundation wall that's insulated with foam board. The rest of the house is insulated with icyneme, Keefer points out. There are also some passive-solar elements in the home: Expansive windows on the lower-level living room warm the slate floor, which — because of its thermal mass — will hold and release that warmth well after sundown in the winter.

Bathroom reclamation: This bathroom countertop is made out of a piece of walnut reclaimed by builder Doug Keefer.

Keefer relays one of Naar's core concepts for the house: "It's a step toward sustainability. It's a demonstration of what can be done."

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Got stormwater runoff?

We all do

by Melanie Brethauer

Constructed wetland at Drover's Road Preserve in Fairview: This decorative pond shows that stormwater can produce aesthetically pleasing results, in addition to preventing erosion and filtering pollutants. *photo courtesy of Equinox Environmental*

If you drive a car, have a pet, fertilize your lawn, grow a garden, live in a house or have a gravel or paved driveway — then you are affecting stormwater runoff. When rainfall or snowmelt flows over the ground and drains into natural or constructed drainage ways, we call it "stormwater runoff" or simply "stormwater." In some cases, this runoff drains directly into streams, rivers, lakes or oceans. In other cases — particularly in urbanized areas — runoff drains through constructed drainage systems that consist of inlets and underground pipes, commonly referred to as "storm sewers" or "storm drains."

Stormwater entering the storm-drain system usually does not receive treatment. Increasing urbanization can increase the amount of stormwater entering the streams, which also can increase the transport of pollutants into the rivers and streams. The amount of stormwater can be controlled by "detention" ponds. The pollutants can be mitigated by "retention" ponds.

There are three basic types of stormwater ponds:
1) Retention = a water-*quality* device, where water is stored to remove pollutants, pathogens or nutrients (the permanent pond depth is typically 3 feet or more)
2) Detention = a water-*quantity* device, where water is detained to reduce discharge rates and lessen the impact on a downstream storm-water system
3) Erosion Control = a temporary device to protect downstream properties from silt

To protect our streams from pollution, we need to be concerned about nutrients, sediment, pathogens and temperature changes. Nutrients are compounds that stimulate plant growth, mainly nitrogen and phosphorous (lawn fertilizer and pet waste are major contributors of this type of stream pollution). Drinking-water contamination can cause health problems. Excess nutrients running off the land and reaching surface waters can cause massive algae blooms. When the algae decays,

it creates odors and consumes the dissolved oxygen in the water, which results in fish kills. While this type of pollution is typically not a big concern for our mountain streams, it is a problem for our lakes and an even larger problem for the areas downstream of us, such as the piedmont and coastal zones of North Carolina and parts of South Carolina.

Sediment is the silt, sand, dirt and gravel that's eroded by stormwater runoff and flows into the streams and lakes. Sedimentation can alter stream flow, erode channels, deposit silt in new locations and suffocate fish and plant life. On the construction or agricultural sites, erosion-control devices are designed to retain sediment.

Pathogens are organisms — bacteria, viruses or protozoan — that cause illnesses, such as typhoid and dysentery. Urbanization can increase the temperature of cold-water stream environments by transferring solar radiation captured by pavement to receiving water bodies through stormwater runoff. Due to the sensitivity our native trout have to water temperature, such increases are of particular concern in Western North Carolina.

Nutrients, pathogens and temperature changes can be mitigated by Best Management Practices. The BMP selected varies depending on location (soil types, annual temperatures and rainfall, for example).

In WNC, we use rain gardens, bio-swales, wet and dry ponds, porous pavement, rooftop runoff management (green roofs/cisterns) and rainwater harvesting (rain barrels) as common BMPs. Clustering development and reducing the overall impervious footprint also reduces stormwater runoff and increases infiltration into the natural soil. The basic goal of any BMP is to try and restore the natural stormwater patterns that have been disrupted by development. The exact combination of BMPs used is site specific. The North Carolina Arboretum has many examples of these. Whether designing a large site or adding to an individual lot, the trick is to be creative and use multiple devices.

Some BMPs can reduce the construction cost for a building site. Allowing streets to sheet flow into bio-swales can cost less than curbs/gutters with inlets and concrete pipe, for example. The individual property owner may consider adding anything from rain barrels to rain gardens to help improve our stormwater.

For additional design information, the N.C. Division of Water Quality publishes a BMP manual with specifications (http://h2o.enr.state.nc.us/su/bmp_forms.htm). The NCSU Stormwater Engineering Group has a Web site with examples of the latest research for innovative treatment practices for developments or individual homeowners (www.bae.ncsu.edu/stormwater/). The Land-of-Sky-Regional Council has "Stormwater Fact Sheets" that include a wealth of information (www.landofsky.org/planning/p_water.html). And Green Streets Program (Portland, Ore.) has an urban stormwater program (www.portlandonline.com/BES/index.cfm?c=44407).

Melanie Brethauer, PE, CFM, is a partner at the Asheville-based WNC Professional Engineers & Surveyors, where she heads the Civil Engineering division. She is a member of the LEED for Neighborhood Development Corresponding Committee, the Congress for New Urbanism, the U.S. Green Building Council and the WNC Green Building Council. She brings more than 24 years of design and permitting experience, having worked as an engineer in 10 states, plus the United Arab Emirates. She can be reached at mbrethauer@wncpes.com or at (828) 277-5074, ext. 103.

Water paybacks

Savings are only a drop away

by Matt Siegel

Basic assumptions:
For ease of understanding, let's say water costs 1 cent/gallon. We are also assuming a two-person household, averaging five toilet flushes per person per day, one 10-minute shower per person per day, four loads of laundry per week and 1 minute of running the bath faucet per person per day.

Water rates in Asheville and Buncombe County:
- Basic rate: $3.45/CCF (1 CCF = 748 gallons)
- Sewer treatment MSD: $3.51/CCF
- Total cost for a gallon of water: $6.96/CCF or $.009/gallon

Faucet aerator:
Assume the bath faucet is on 1 minute per person per day.

- Standard faucet aerator uses 2.2 gallons/minute.
- Low-flow aerators use as little as .5 gallons/minute.
- Savings from installing a new aerator: 1.7 gallons/minute
- 1.7 gallons/minute X 1 minute/day X 2 people = 3.4 gallons/day
- 3.4 gallons/day X 7 days/week X $.01 = $.24/week or $12.48/year and 1241gallons/year
- With the cost of a faucet aerator at $1 each, the payback period is about four weeks.
- For a household of four people, the payback period is about two weeks.

Washing Machine:*
Assume four loads per week for two people.

- Standard washing machines use 33 gallons/load.
- Front-loading Energy Star washing machines use 15 gallons/load.
- Savings from buying a front-loading washer: 18 gallons/load
- 18 gallons/load X 4 loads/week = 72 gallons/week
- 72 gallons/week X 52 week/year X $.01 = $37.44/year and 3744 gallons/year
- With a front-loading Energy Star washer costing $300 more than a standard washer, the payback period is about eight years.
- For a household of four people or eight loads of laundry a week, the payback is four years. *Source: USEPA consumer calculator.

Note: None of these paybacks take into account the energy savings from reduced hot water use. Hot water costs an additional 1 cent per gallon to produce, thus making payback periods even shorter.

Toilet:
Assume 10 flushes per day for two people.

- Older toilets use 3.5 gallons/flush.
- New toilets use 1.6 gallons/flush.
- Savings from installing a new toilet: 1.9 gallons/flush
- 1.9 gallons/flush X 5 flushes per day X 2 people = 19 gallons/day
- 19 gallons/day X 365 days/year X $.01 = $69.35/year and 6,935 gallons/year
- With a new toilet costing about $80, the payback period is about 14 months.
- For a household of four people, the payback is about seven months.
- Code toilets use 1.6 gallons/flush.
- Ultra low-flow toilets use 1.1 gallons/flush.
- Savings from installing an ultra low-flow toilet: .5 gallons/flush
- .5 gallons/flush X 5 flushes per day X 2 people = 19 gallons/day
- 5 gallons/day X 365 days/year X $.01 = $18.25/year and 1,825 gallons/year
- With the difference in cost between an ultra low-flow and standard toilet at about $100, the payback period is about 5.5 years.
- For a household of four people, the payback is about two years and three months.

Showerhead:
Assume one 10-minute shower per person per day.

- Standard showerheads use 2.5 gallons/minute.
- Low-flow showerheads use 1.75 gallons/minute.
- Savings from installing a low-flow showerhead: .75 gallons/minute
- .75 gallons/minute X 10 minutes/day X 2 people = 15 gallons/day
- 15 gallons/day X 30 days/month X $.01 = $4.50/month or $54/year and 5475 gallons/year
- With a new showerhead costing about $5, the payback period is just over one month.
- For a household of four people, the payback period is about two weeks.

EPA WaterSense Program

Saving water saves energy

compiled by Candice Black

• Americans now use an average of 100 gallons of water each day — enough to fill 1,600 drinking glasses! A recent government survey indicated that at least 36 states are anticipating local, regional or statewide water shortages by 2013.

• If all U.S. households installed water-efficient appliances, the country would save more than 3 trillion gallons of water and more than $18 billion dollars per year!

• Letting your faucet run for five minutes uses about as much energy as letting a 60-watt light bulb run for 14 hours.

• Efficient water use can also reduce the amount of energy needed to treat wastewater, resulting in less energy demand and, therefore, fewer harmful byproducts from power plants.

• If just 1 percent of American homes replaced an older toilet with a new WaterSense labeled toilet, the country would save more than 38 million kilowatt-hours of electricity — enough electricity to supply more than 43,000 households for one month.

Source: www.epa.gov/WaterSense/water

Plumb green with graywater

Reclaiming graywater in N.C.

by Georg Efird

Graywater is not a new term to many of us. It is water that has been used in the kitchen sink, washing machine, bathroom lavatories, showers, tubs and condensation systems. The amount of graywater available varies from household to household depending on the amount of water use by humans.

Blackwater, on the other hand, accumulates in any receptor that receives human waste, such as water closets, urinals and bidets.

To reap the benefits of reclaiming graywater, all blackwater drain, waste and vent systems must be piped separately from graywater drains. This procedure requires a licensed plumber and preferably one who is an accredited green plumber with experience in graywater reclamation and water conservation.

The use of graywater has been around for decades, but most local codes limit or do not allow graywater use. There are many different variables that determine the type of graywater system to be used.

The system familiar to most people is one that routes kitchen-sink and washing-machine wastewater outside the home separately from the sewer line. Typically, the graywater waste line is piped 2 feet underground into a bed of dry gravel. This system was designed only to reduce the strain on the septic leach field. Septic systems were sized by accounting for this system. If you have ever seen a kitchen sink or washing machine piped underground, it was probably this type of graywater system. This system is no longer legal in the state of North Carolina.

Get it approved: In North Carolina, all graywater systems must be approved by code officials prior to installation per job site. *photo courtesy of A2Z Plumbing*

Widely used in the Western part of the U.S., another approach is one in which all graywater pipes are combined, but separate from blackwater pipes. Once graywater reaches the outside of the home, it is piped into zones that feed different areas of landscape, garden, fruit trees and other needs. The piping is sized according to the amount of graywater needed for irrigation. Every garden zone has a zone valve to regulate flow.

Every fixture inside the home has a 3-way valve that can divert the graywater back to the sewer drain line when the gardens/landscapes are sufficiently hydrated. During times of drought or hot summer — when gardens need water the most — the valve can be set to stay on graywater. This method of reusing graywater is also illegal in N.C.

A third type of graywater reclamation system has been legal in N.C. since 2006. It is a current legal plumbing code in the 2008 International Code Council and International Plumbing Code book, volume 1, plumbing code. There are very strict guidelines to follow. Here are a few of them:

- No less than a 50-gallon tank may be used.
- No more than a 120-gallon tank may be used.
- Vent, drain and waste must not be intermingled.
- There must be a separate water supply line from the graywater supply line.
- All graywater piping must be labeled as unsuitable for drinking.
- Reclaimed graywater can only be used for water closet and urinal flushing.
- Chlorine and green dye are required.

In N.C., all graywater systems must be approved by code officials prior to installation per job site. The officials you need to speak with are Mark Case, City of Asheville, or Matt Stone, Buncombe County. Most counties in N.C. are in favor of this system.

There are also graywater reclamation systems that can be installed under the kitchen or bathroom sink. These are smaller versions of the ➠

systems explained above, in which the pipes do not have to be rerouted. The price of a graywater reclamation system varies depending on the amount of fixtures from which graywater is reused. For a whole-house system that uses graywater to flush water closets, bidets and urinals, you are looking at prices ranging from $1,300 to $1,700 per bathroom. An under-sink type of graywater reclamation system costs approximately $400 to $700 to install. These are only estimates, as all buildings and plumbing systems are different.

In conclusion, a graywater system will save approximately 40 percent of your freshwater use, thus reducing strain on our ever-decreasing water supply and your water footprint.

Georg Efird is president and owner of A2Z Plumbing & Gas Piping Inc.

The WRP gang

Waste Reduction Partner volunteers share sustainability expertise

by Terry Albrecht, PE

Ever wonder what all those engineers, research scientists and industrial professionals end up doing once they retire from their day jobs? Fifty of them are volunteering with Waste Reduction Partners, an organization that supports sustainability efforts in our community. These retired professionals work one-on-one with institution and business managers, sharing strategies on becoming more efficient, cutting utility costs and reducing environmental footprints.

As our region is confronted with increasing energy costs, drought, landfill-capacity stresses and other environmental challenges, WRP engineers and scientists keep delivering their technical assistance to businesses. They offer energy-efficiency strategies and water-conservation measures, as well as advice for diverting industrial byproducts for recycling and helping municipalities achieve their environmental requirements and objectives via preventive approaches.

Since 2000, these baby-boomer volunteers have assisted more than 700 Western North Carolina businesses, industries and institutions. Their assistance has reduced utility costs by $23 million. In concert with these cost savings, organizations have substantially reduced their environmental impacts — cutting electrical usage by 64,000 megawatt-hours and reducing water use by 220,000 gallons annually. WRP volunteers have collectively contributed more than 111,000 hours in technical service and consultation.

WRP volunteer scientist Dr. Elaine Marten says, "I became a chemist because I love chemistry. I didn't stop loving it just because I'd retired." Marten has worked on projects ranging from the development of innovative construction products using recycled coal ash to creating biodegradable plastics using milk whey and proteins. Like many of the program volunteers, Marten follows her own interests and time schedule on these projects.

Tom McCullough, a retired textile executive, leads the WRP team in solid-waste reduction and recycling outreach. McCullough has a running list of about 40 businesses and industries that he's helping to optimize their solid-waste-management strategies, while reducing operating costs. He has helped businesses divert more than 164,000 tons from industrial and sanitary landfills. "It takes time to find the right recycling market and processors," McCullough explains. "Every facility has their unique issues and unique solutions," he says as he prepares to meet a client.

In recent years, the WRP team had been expanding its energy-management strategies, as North Carolina implements its 2007 renewable and energy-efficiency portfolio standards and its own state-utility saving goals. Through a recent grant from the State Energy Office, WRP Energy engineers completed 110 on-site energy efficiency audits, recommending more than $5.4 million in annual cost savings. Retired plant manager from Brunswick Corporation Wayne Rumble says, "Our follow-up studies have shown that clients are implementing almost half of our audit recommendations. That's pretty good, since we don't provide any funding to them [other than] a cost/benefit analysis."

WRP clients may be interested in how to "go green," track their carbon footprint or meet corporate cost-reduction and sustainability goals. "No matter what the driver, our objective is to show practical, cost-effective efficiency opportunities," says Russ Jordan, WRP energy services manager. Jordan estimates that CO2 offsets from his clients' efforts are equivalent to removing 8,010 vehicles off the highways each year. "We're seeing a ramping up of all these kinds of requests," he reports.

Still advising: Waste Reduction Partner volunteers completed 110 on-site energy-efficiency audits, recommending more than $5.4 million in annual cost savings. *photo courtesy of WRP*

Waste Reduction Partners is a program of the Land-of-Sky Regional Council, with staff support by the N.C. Division of Pollution Prevention and Environmental Assistance. Its grant-funded technical assistance is offered at no cost to non-residential organizations in WNC. For more information on services or volunteering, go to www.landofsky.org/wrp.

Terry Albrecht, PE, is the director of Waste Reduction Partners. He can be reached at terry.albrecht@ncmail.net or at (828) 251-6622.

By the numbers

WRP's achievements in 2008

- Number of volunteers: 48
- N.C. counties served: 26
- Organizations assisted on-site: 133
- Technical assistance provided: 18,166 hours
- Projected energy savings: 10,860,000 kWh
- Projected water savings: 3,068,000 gallons
- Solid waste diverted from landfills: 21,061 tons
- Total client cost savings (2008): $1,852,000

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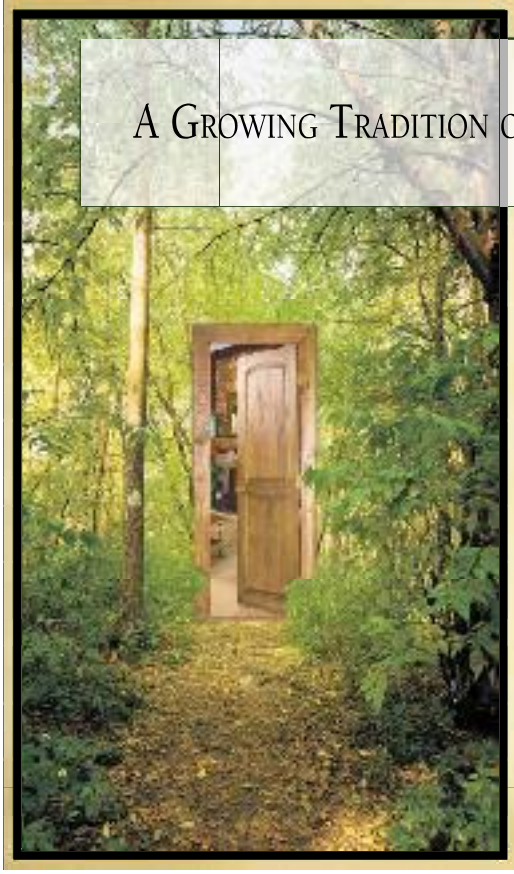

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An illuminating perspective

Trends in lighting

by Dale F. Reynolds

In the past 100 years, the science and technology of illumination has taken us from candlepower to solar power. Correspondingly, lighting and lighting-control technologies have evolved. We're affected — both physically and emotionally — by the science of artificially lighting the spaces where we live and work. The quantity and quality of light we require on a daily basis depends on many different parameters, including individual preferences, perceptions, necessities, interpretations and subjectivity. Light fixtures (luminaires) and light sources (lamps) are selected based on practicability, energy efficiency and aesthetics, among other criteria.

As a result of the Energy Security and Independence Act of 2007, increases in the efficiency of our current light sources are required by 2020. In response, the lighting industry has produced several alternative products with improved efficiencies, but unfortunately, these products have met with limited acceptance by the public and some lighting designers.

As the old Bob Dylan song goes, "For the times, they are a-changin'." Directed marketing and current trends towards sustainability and "green" living are converting the old paradigms into new approaches.

Lighting matters: At Indian Wells Town Hall, the conversion to Cree LR6 LED lights reduced electricity consumption by 80 percent. *photos courtesy of Essential Systems Engineering*

For example, compact fluorescent lamps (CFLs) — despite initial problems with poor quality and disposal issues due to mercury content — are starting to replace the highly inefficient incandescent lamps in general lighting applications, and they are becoming more acceptable to the public. Linear fluorescent tubes have evolved from T-12s to T-8s and now T-5s, T-4s and T-2 minis. Each is a more compact, improved version of the other, in terms of luminous efficacy, which is the amount of light produced compared to the power consumed.

More recently, fluorescent electrode-less induction lamps have entered the market. They provide an extremely long life, vibration resistance and high efficacies. But at this point in time, these lamps tend to be very costly, and they are used primarily in specialized applications, such as roadway, railroad lighting and locations that are difficult to reach and maintain.

The current trend towards lighting future commercial and residential buildings is solid-state lighting or light-emitting diodes (LEDs). The latter offer a potential energy savings over incandescent that could have a significant impact on limiting the energy normally consumed by current, conventional lighting systems. Another benefit is the increased longevity of the LEDs — 50,000 to 100,000 hours — which could potentially reduce landfill waste and other environmental concerns. (By comparison, a typical A-19 incandescent light bulb average life span is 3,500 hours and a 4-foot T-12 fluorescent lamp averages 20,000 hours.) Lighting manufacturers are currently producing LED replacement lamps for incandescent lamps in recessed downlights, halogen MR-16 lamps, street and area lights and fluorescent tubes. They also are introducing new specifically designed, "purpose-driven" LED luminaries, such as pendants; recessed downlights; cylinders; landscape accent and floods; and street, garage and display lighting, to name a few. Furthermore, LEDs are extremely tolerant of cold temperatures and have good color characteristics. Other benefits include instant on/off, vibration resistance, dimming, programmed color changes and no mercury.

Other emerging artificial lighting technologies that could develop into commercial and residential applications are two-photon phosphor fluorescents, fiber optics, sulfur lamps and electroluminescence, among others. These technologies have been years in the making and have modest success in specialized lighting applications. However, with the current emphasis on increased luminaire efficiencies and lamp efficacies, some designers and consumers are considering their advantages now.

Using daylighting techniques to more effectively and naturally light spaces deep within the buildings — by utilizing specialized glazing, light shelves, sun tubes and skylights — is the most efficient technology for lighting. If properly designed, daylighting methods and techniques can significantly reduce the amount of energy consumed by artificial lighting and decrease the overall energy use required for cooling the building.

Once the most efficient product has been chosen, the most important technique is controlling how much the lights are used. Automatic lighting controls can lead to an estimated 50 percent reduction in lighting energy. Commercial buildings are incorporating Direct Digital

Before and after: At N.C. State University, the parking deck was lit by the dingy orange glow of high-pressure sodium fixtures (left); the new LEDs brighten the space and save 27 percent in energy costs.

Control (DDC) systems that can be programmed through the Energy Management System (EMS) to reduce lighting energy requirements through the use of occupancy sensors, photocells and timers.

When considering cost, a general rule of thumb is that the installed cost of fluorescent over incandescent can range upward from 15 to 50 percent for an individual fixture and 10 to 30 percent overall on a per-project basis, depending on the number of fixtures installed. In contrast, at current price levels, LED fixtures cost 300 to 500 percent more than incandescent. Payback periods can range from three to 10 years depending on the cost of the installed fixtures, hours operated per year, annual maintenance and operational costs and the local cost of energy.

In the future, the art and science of illuminating living/working spaces will be done with energy efficiency in mind. Lighting will become automatic and regulated. Buildings will be oriented and configured to take advantage of natural sunlight. Lamps and luminaires will require less maintenance and become recyclable. Technology will develop lighting that is cooler to operate, with more flexibility to personal preferences. As energy costs increase, owners will recognize marketable benefits and increased profits.

Dale F. Reynolds, PE, LEED AP, BSEE N.C. State, is vice president of Essential Systems Engineering, PA and has provided design and consulting services for building lighting and electrical distribution systems for 10 years.

Fact sheet: Air sealing

by Maggie Leslie

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 (the measure of how well your insulation resists heat flow), 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.

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

• Seal band joists with caulk, spray foam or gasketing between the 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 the insulation.

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

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

• For fireplace cavities on exterior walls, a rigid air barrier must be fully aligned with the insulated framing in the framed shaft behind the fireplace. and any gaps must be 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, such as the ceiling between the house and the attic) 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, such as caulk, foam or rigid material. Fibrous insulation does not stop airflow.

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

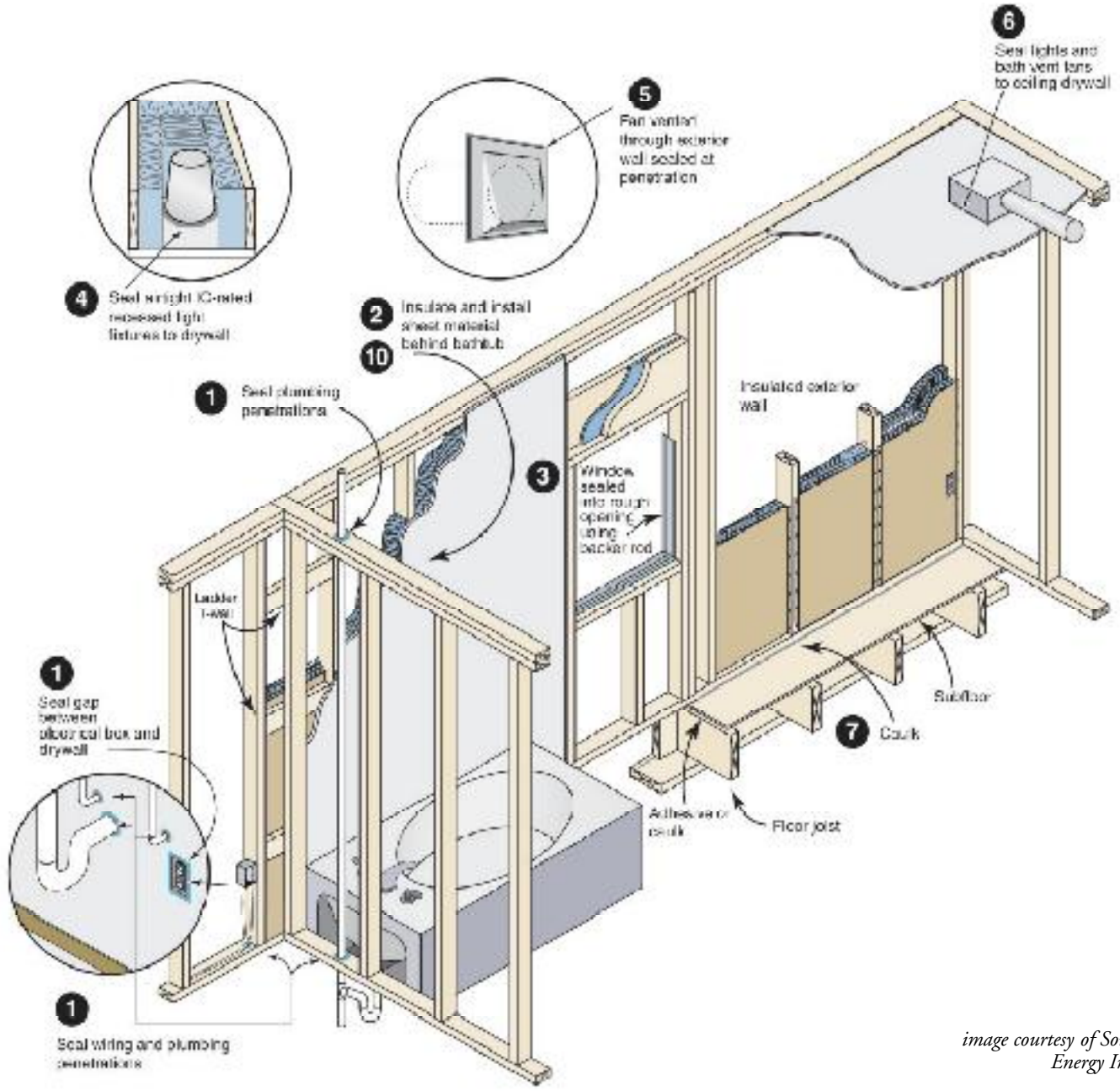

image courtesy of Southface Energy Institute

Fact sheet: 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 each one does a good job of 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). If the insulation is not encapsulated by a rigid material on all six sides, it will not insulate properly.

• Insulation should be installed to fill 100 percent of every cavity.

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

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

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

• Attic insulation should extend all of the way to the exterior edge of the top plate of the wall below without compression. Roof-framing details, such as raised-heel trusses or oversize trusses, must allow for this.

• Insulation baffles 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. It should 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 (the measure of how well your insulation resists heat flow).

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

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

• Use single-ply headers where possible to allow for insulating headers above windows and doors. It is possible to insulate headers by using

foam sheathing as a spacer instead of plywood or oriented strand board, 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).

• Interior/exterior wall intersections should be framed using ladder T-walls in order to maximize the area of insulation on the 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 fact sheet include Advanced Energy System Vision Guidelines, Southface Energy Institute Technical Bulletins, HealthyBuilt Homes program guidelines and Energy Star guidelines for homes and indoor quality.

Properties of Common Insulation Types

Insulation Type	Installation Method	R Value/ In	Raw Materials	Pollution from Manufacturer	IAQ Impacts	Air Barrier	Comments
Cellulose	loose fill/blown in, dense pack, wetspray	3-3.7	recycled newspaper, nontoxic borate and ammonium sulfate	negligible, virtually no waste during install	fibers and chemicals can be irritants	no	high recycled content, low embodied energy, common for retrofit in existing walls
Fiberglass	batts, blown in	3.5-4	silica, sand, boron, phenol formaldehyde, cullet	energy use during manufacture, formaldehyde emissions, no waste during install of blown in	fibers and chemicals can be irritants	no	some recycled content, some formaldehyde free products are available
Cotton	batts	3-3.7	cotton and polyester mill scraps	negligible	considered very safe	no	
Open Cell Spray Polyurethane Foam	sprayed in	3.4-4.5	fossil fuels, water based blowing agent	energy use during manufacture, waste during install, less material used per volume than closed cell	toxic during installation, considered safe once cured	yes	expands to fill cavity and create an air tight wall, some products available with 20% agricultural based oils to offset fossil fuels
Closed Cell Spray Polyurethane Foam	sprayed in	5.5-7	fossil fuels, HFC-245fa blowing agent	energy use during manufacture, waste during install	toxic during installation, considered safe once cured	yes	expands to fill cavity and create an air tight wall, some products available with 20% agricultural based oils to offset fossil fuels, considered a vapor barrier
Air Krete	spray in	3.9	magnesium oxide from sea water, ceramic talc	negligible, ceramic talc is mined	considered very safe	yes	highly fire-resistant, non-expansive "foamed minerals"
Polyisocyanurate Foam	foil faced rigid board	6-6.5	fossil fuels, pentane blowing agent, flame retardant	energy use during manufacture	negligible	yes	non-HCFC blowing agent
Extruded Polystyrene (xps)	rigid board	5	fossil fuels, HCFC blowing agent, flame retardant	energy use during manufacture, ozone depletion	potential release of styrene monomer (a carcinogen)	yes	last remaining insulation with ozone depleting blowing agent
Expanded Polystyrene (eps)	rigid board	3.6-4.4	fossil fuels, pentane blowing agent	energy use during manufacture, pentane emmissions contribute to smog	potential release of styrene monomer (a carcinogen)	yes	white foam board- same as used for styrofoam cups

Adapted from Environmental Building News: Insulation Materials – Summary of Environmental and Health Considerations, January 1, 2005

Fact sheet: 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 manual J heat-loss/heat-gain calculation must be completed. The 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 HSPF. 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 using fiberglass mesh tape and duct mastic; 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 as the load specifies.

• 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 then 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 fact sheet include Advanced Energy System Vision Guidelines, Southface Energy Institute Technical Bulletins, HealthyBuilt Homes program guidelines and Energy Star guidelines for homes and indoor quality.

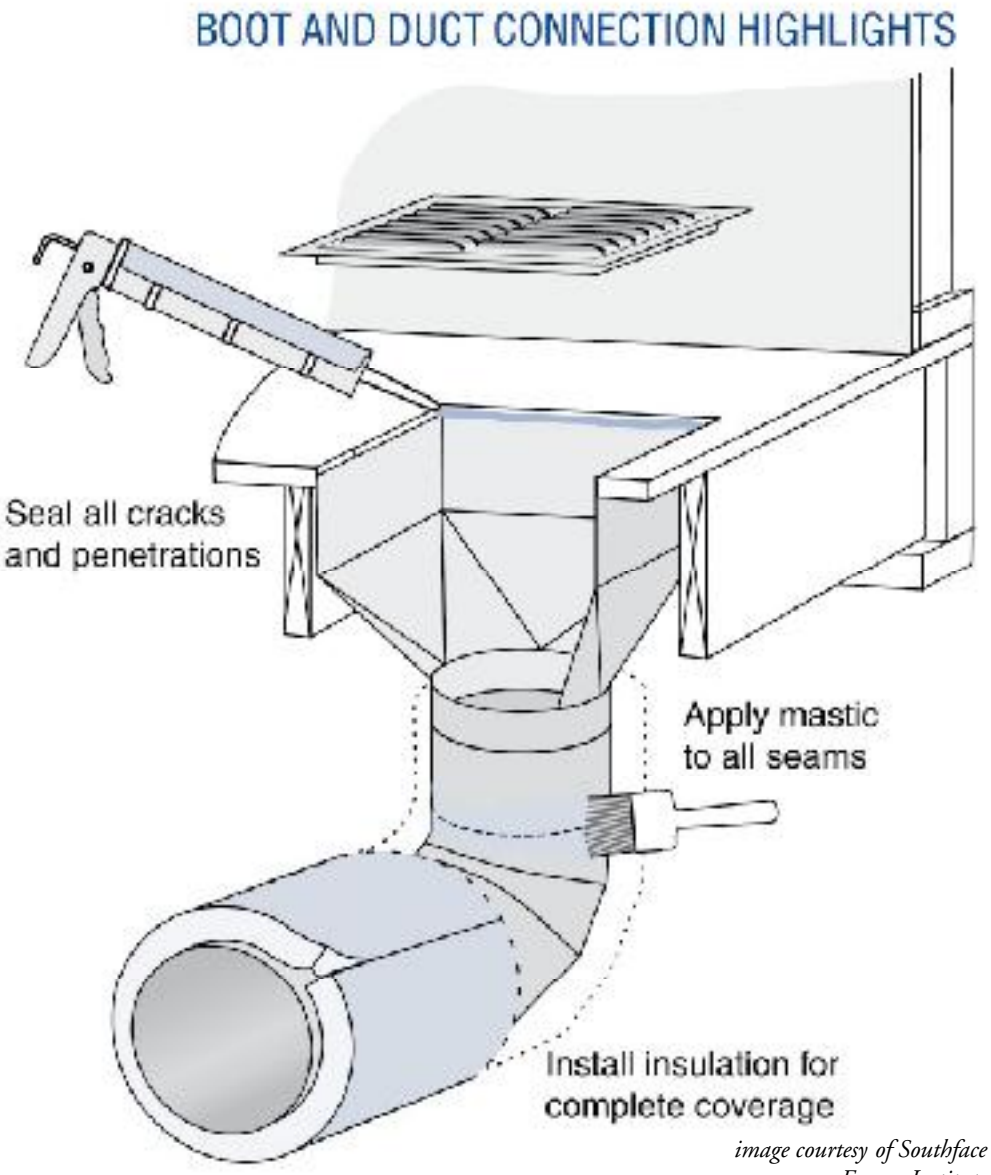

image courtesy of Southface Energy Institute

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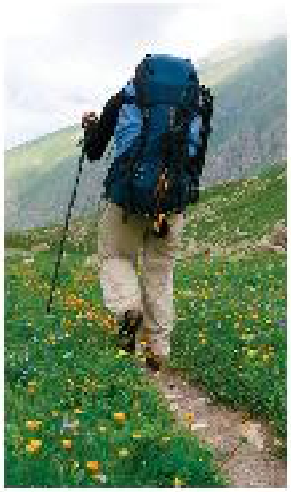

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The Original Green Builder

Fact sheet: Energy-efficiency retrofit

by Maggie Leslie

The average American family spends about $1,500 a year on utility bills, according to the Rocky Mountain Institute. This could be reduced dramatically by making a few adjustments and improvements. Some energy-saving measures are simple and inexpensive, while others more complex and costly. This checklist will help you figure out where to start. Some of the cheapest, easiest retrofits will save you the most. When you are ready to get started, the Southface Energy Institute offers a free downloadable guide called "Home Energy Projects: An Energy Conservation Guide for Do-It Yourselfers." It provides a lot of information on how to perform the tasks yourself, where to get the material, and how much it will cost.

Where to begin

• Determine your savings. Collect a year's worth of utility bills and divide their total by the heated square footage of your home. According to RMI, most bills are about $.60-$.90 per square foot. If you are in this range, or even higher, the low-cost and no-cost measures will be a great place to start.
• Assess your house. Measure the thickness of the insulation in your attic, basement and walls. What is the age and condition of your HVAC system and water heater? Is your home drafty?
• Determine the financial incentives. There are currently federal incentives for upgrading water heaters, HVAC, insulation etc. Visit www.energytaxincentives.org/consumers and www.dsireusa.org for a comprehensive list.
• Consider a comprehensive audit. The directory includes a list of Building Performance Contractors (see Listings). These trained professionals will come to your home and perform an energy audit. They can recommend improvements and provide contracting services, if you would prefer not to do the work yourself.

Low-cost efficiency method: Caulking and weather stripping are two of the least expensive approaches for improving energy efficiency as demonstrated by Delario Cato. *photo courtesy of Asheville GO!*

No-cost measures

Heating and cooling

• Set back your thermostat in the winter when you are not at home or when you go to bed at night.
• Make sure your fireplace damper is closed and sealed.
• Keep your filters clean.
• Keep shades drawn on sunny days in summer and after sunset in winter.
• If it doesn't have glass doors, do not use your fireplace when the heat is on.
• Close heating vents in unused rooms.

Water and water heating

• Turn down the thermostat on your water heater to 120°F.
• Use energy-saving settings on dishwashers and washing machines.
• When possible, use cold water for rinsing dishes, for running food disposals and for laundry.
• Do not leave the water running continuously when brushing teeth, washing hands or rinsing dishes.
• Run your clothes washer and dishwasher only when full.

Lighting and appliances

• Clean your refrigerator condenser coils.
• Avoid the heat-dry feature on your dishwasher.
• Air dry your clothes instead of using a clothes dryer.
• Keep the dryer exhaust vent clean.
• Turn off lights when you leave a room.
• Use toaster ovens, pressure cookers or other small appliances instead of the oven when possible.

Low-cost measures

Heating and cooling

• Install a programmable thermostat for about $30.
• Repair any broken window panes.
• Change your air filter. Be careful when choosing a new air filter. High MERV filters work great for air quality, but they may adversely affect the performance of your system by causing too much resistance.
• Seal holes, leaks and gaps through walls, ceiling and floor using caulk or spray foam. Some holes may be large enough that they require rigid blocking before sealing.
• Install gaskets on electrical outlets ($5).
• Weatherstrip doors and windows ($25-$50).
• Insulate and weatherstrip your attic hatch or door.
• Insulate knee walls by putting rigid backing on any vertical walls between the house and the attic.
• Seal your ductwork with mastic, and then have a tune up on your heating and cooling system. Duct leakage can increase your heating/cooling bill by 10 to 30 percent and compromise your air quality.

Water and water heating

• Install low-flow, WaterSense-rated faucets and showerheads ($1-$4).
• Install an insulating jacket on your water heater ($17).
• Insulate your hot water pipes.
• Repair leaky faucets and toilets. The WNC Green Building Council has tablets available for determining if you have a leaky toilet ($5-$10).
• Install a timer for your water heater so it only heats water when needed ($40).
• Install a rainbarrel for outdoor watering ($25-$100).
• Install a toilet tank bag to reduce the amount of water used per flush ($2).

Lighting and appliances
• Switch out inefficient incandescent bulbs to energy-saving compact fluorescents ($2 each).
• Plug appliances into a power strip that can easily be turned off to reduce ghost loads.

Higher-cost measures with a quick payback

Heating and cooling
• Insulate your ductwork to R-8.
• Install insulating blinds and shades, or add insulating storm windows.
• Have a blower door test performed to identify more leaks in the building envelope and seal them well. Consider adding ventilation, depending on the air tightness you reach.
• Install R-38 insulation in the attic (make sure all holes are sealed first!).
• Install R-19 insulation in your floors (make sure all holes are sealed first!).

Water heating
• Install a high-efficiency or a gas-tankless water heater.

Lighting and appliances
• Replace inefficient appliances with Energy Star-rated refrigerators, dishwashers, washers and dryers.

Higher-cost measures with a long-term payback

Heating and cooling
• Install wall insulation. Blown cellulose can be installed in existing walls.
• Install ceiling fans.
• Replace your central heating and air system with a more efficient model.
• Install exterior solar shade screens, awnings or removable trellises where appropriate to shade from overheating in the summer.
• Replace windows with double-paned low-e windows with a U-value of less than .35.

Water heating
• Convert to solar water heating. Consider integrating it with space heating. The current tax credits available make it much more affordable than ever before.

Sources for this fact sheet include Southface Energy Institute, "Home Energy Projects: An Energy Efficient Conservation Guide for Do-It-Yourselfers," www.southface.org/web/resources&services/publications/large_pubs/Home-Energy-Projects.pdf and Rocky Mountain Institute, "Home Resource Efficiency," www.rmi.org/sitepages/pid206.php.

Smart selections: Wood

When choosing wood products, look for the FSC-certified label. Products carrying this label are independently certified to assure consumers that they come from forests that are managed to meet the social, economic and ecological needs of present and future generations. *Source: www.fsc.org/about-fsc.html*

Fact sheet: A passive-solar primer

by Maggie Leslie

If designed properly, a home can be heated with minimal additional cost through the use of passive-solar design. By simply siting the home and allocating glazing properly, a home can take advantage of our free, readily available heating source: the sun. Here are six steps to get you started. (See "Fact Sheet: Air Sealing" and "Fact Sheet: Insulation.")

1. Build an energy-efficient building envelope. The first component of any passive-solar home is to make sure the building envelope is as energy efficient as possible. Make sure the home is well sealed and insulated. By reducing these energy losses, you can more easily meet the heating and cooling needs of the home.

No-fuss solar: Using passive-solar design, including a calculated amount of thermal mass and glazing, can supply significant amounts of the heating needs for the home, as at Brian Knight's Montford home. *photo courtesy of Candice Black*

2. Orient the home to the south. To maximize the amount of solar gain in the winter, site the home so that the longest wall of the home faces within 15 degrees (plus or minus) of true south. If 15 degrees is too much of a design constraint, 30 degrees off of true south can still provide about 85 to 90 percent of the optimal winter heat gain. Make sure there are no large obstacles such as buildings or trees that will block heat gain in the winter. Deciduous trees are acceptable and actually provide an advantage in the summer.

3. Size glazing and thermal mass properly. Passive-solar homes are typically either suntempered or direct-gain systems. Suntempered homes do not have thermal mass, a material that stores heat. These designs should have no more than a 7 percent ratio of glazing to floor area on the south side of the home. Direct gain system should have 7 to 12 percent glazing to floor area of south-facing glass. For each square foot of glass above 7 percent, it should be accompanied by 3 to 6 square feet of 4-inch thick masonry to act as thermal mass. However, surface area or square footage of thermal mass is more important than thickness. The surface absorbs heat during the day and slowly releases heat as the temperature drops. Additionally, comfort is improved if the mass is evenly distributed in the room. For either design, minimize the amount of east and west facing walls and glass to reduce overheating in the summer. East and west glazing should be less than 5 percent of the floor area to prevent overheating.

4. Choose windows wisely. On the south side of the home, choose a window with a high Solar Heat Gain Coefficient (about .55 or higher) and a low U- factor (about .35 or less). This will maximize heat gain, but minimize heat loss. On the east and west choose a window with a lower SHGC and a similar U-factor. This should be accompanied by a vertical-shading element, such as an insulating blind (insulating blinds are also a great option for evening use on south-facing windows.)

5. Size overhangs properly. South-facing windows should be accompanied by properly sized overhangs to prevent overheating in the summer. "As a rule of thumb in North Carolina to prevent summer gains, the angle α between a line 'S' from the edge of the overhang to the bottom of the window and a vertical line 'V' should be approximately equal to the latitude minus 18.5 degrees. To prevent wintershading, the angle β between a line 'W' from the edge of the overhang to the top of the window and a vertical line should be approximately equal to the latitude plus 18.5 degrees. For more detailed calculations, use computer simulation software or procure the services of a professional solar designer." (NCSC) Mature deciduous trees are also a great option — they permit most winter sunlight to pass through (60 percent or greater), but provide nice shade in the summer. Evergreen trees, on the other hand, should be placed on the north and west sides of the home to buffer winds and afternoon sun. (See the diagram at the N.C. Solar Center Web site listed below.)

6. Design rooms to match the passive solar design. Place rooms that have minimal heating and lighting requirements (such as garages and storage rooms) on the north side of the home. The kitchen is also a great choice for a room on the northern side because it produces its own heat. Keep in mind that furniture, rugs and tapestries will affect the thermal mass performance. Daylighting is an added benefit of passive-solar design. Generally, a ratio of 5 percent glazing to floor area provides enough light for the room. Skylights admit light, but can offer unwanted heat in the summer. Solar tubes may be a good alternative.

Sources for this fact sheet include NC Solar Center: Passive Solar Home Design Checklist, www.ncsc.ncsu.edu/information_resources/factsheets/PassiveDesignChecklist.pdf, Southface Energy Institute: Passive Solar Design Technology Fact Sheet, www.southface.org/web/resources&services/publications/technical_bulletins/PSD-Passivesolar%2000-790.pdf and Re-Arch: The Initiative for Renewable Energy in Architecture Fact Sheet, www.rearch.umn.edu/factsheets/PassiveSolarFactSht.pdf.

Smart selections: Paint

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Many VOCs reach consistently higher concentrations indoors—up to 10 times higher—than occurs outdoors. When choosing paint, select a paint with 0-50 g/L of VOCs.
Source: www.epa.gov/iaq/voc.html

Fact sheet: 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. To prevent unwanted moisture and contaminants from entering, it is very important to build a tight home, but it is also crucial to provide ventilation to the home to facilitate 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

The home needs to be as tight as possible through proper air sealing. Then, fresh-air ventilation needs be provided mechanically to the home (not too much, not too little). The American Society of Heating, Refrigerating and Air Conditioning Engineers requires 7.5 cubic feet of air per minute per person (i.e., per bedroom) plus 7.5 cfm, plus an additional 1 percent of total floor area of fresh-air ventilation.

This isn't as complicated as it sounds. The two most common methods for achieving this are: 1) Run a supply duct from a clean source outside of the home into the return duct of the HVAC system. Then install a controller that will make sure your home gets plenty of fresh air even when the air handler is not running often. 2) Install a balanced system. Commonly known as Heat Recovery Ventilators or Energy Recovery Ventilators, these high-tech systems bring in fresh air while exhausting stale air to the outside. Heat (and moisture, in the case of the ERV) is transferred in the process, making it the most energy-efficient ventilation option.

• Install a properly sized and sealed HVAC unit (see "HVAC" 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 cfm. 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 be 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 where 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 any penetrations from the foundation to the home.
• 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.
• 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 fact sheet include Advanced Energy System Vision Guidelines, Southface Energy Institute Technical Bulletins, HealthyBuilt Homes program guidelines and Energy Star guidelines for homes and indoor quality.

The first solar farm in WNC

Seven-acre solar project comes to Haywood County

by Matt Siegel and Michael Shore

Solar arrayed: A seven-acre site in Haywood County will resemble this solar-power farm. *photo courtesy of U.S. Dept. of Energy's Office of Energy Efficiency and Renewable Energy*

One of the largest solar farms in the Southeast is currently under construction right here in Western North Carolina. It is expected that the output of the 3,288 SunPower photovoltaic panels will generate 1.6 million kilowatt-hours per year, or enough energy for more than 1,100 homes. The site for the 1 megawatt solar farm is Evergreen Packaging's old landfill (formerly Blue Ridge Paper), located in Haywood County.

The seven-acre site is a great place for a large-scale solar array because — as a landfill site — no trees, crops or significant vegetation are allowed to grow there. Evergreen has agreed to lease the property to FLS Energy for the next 20 years, converting the largely unusable landfill area into something that will create a public benefit.

Hardy LeGwin of FLS Energy is the lead designer for the project. He says that the magnitude of this solar farm is both its greatest challenge and its reward. "The finished site will look like a scene out of *Star Wars*, as more than 3,000 solar panels track the sun each day. Any design challenges are far outweighed by the opportunity to take the solar sector a quantum leap forward toward making solar energy mainstream."

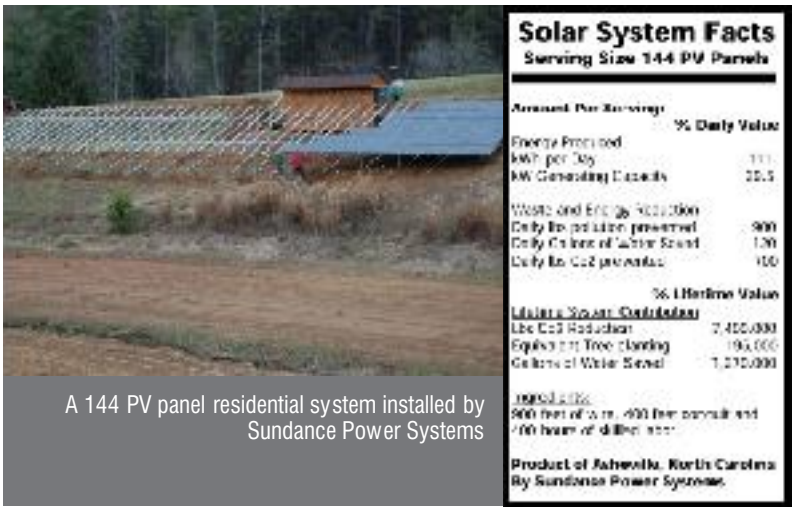
Just a few years ago, a solar project of this scale was hardly conceivable for North Carolina. But opinions in N.C. shifted due to the combination of rising electricity costs, incentives to promote solar (including federal and state tax incentives), the need to reduce global-warming pollution, and a public desire for clean energy and energy independence. The passage of the Renewable Energy Portfolio Standard for N.C. has driven utilities to look for ways to increase the percentage of electricity generated from renewable energy — such as wind, solar and biomass — from less than the current 1 percent to 12.5 percent by the year 2021. As part of that effort, Progress Energy issued a request for proposals for solar-energy generation, from which FLS

Energy's plan ultimately was awarded. Progress Energy has committed to purchasing all of the electricity generated at the site for the next two decades.

Michael Shore of FLS Energy attributes the successful implementation of the project to several factors, including "increased fossil fuel costs, change in intention and diversification of energy portfolios of utility companies, public interest in solar and decreasing costs for panels — thanks to an increase in silicon supplies and an increase in the efficiency of photovoltaic technologies." The financial viability of large solar projects of this kind are also helped by new financing models, such as the one being used by FLS Energy: The company will retain ownership of the system and simply sell the energy, thereby reducing the upfront cost for building owners and utilities.

In addition to the environmental and energy security benefits, this project and others like it will supply the area with good-paying green job opportunities. The system is expected to be completed and on line just in time for Independence Day 2009.

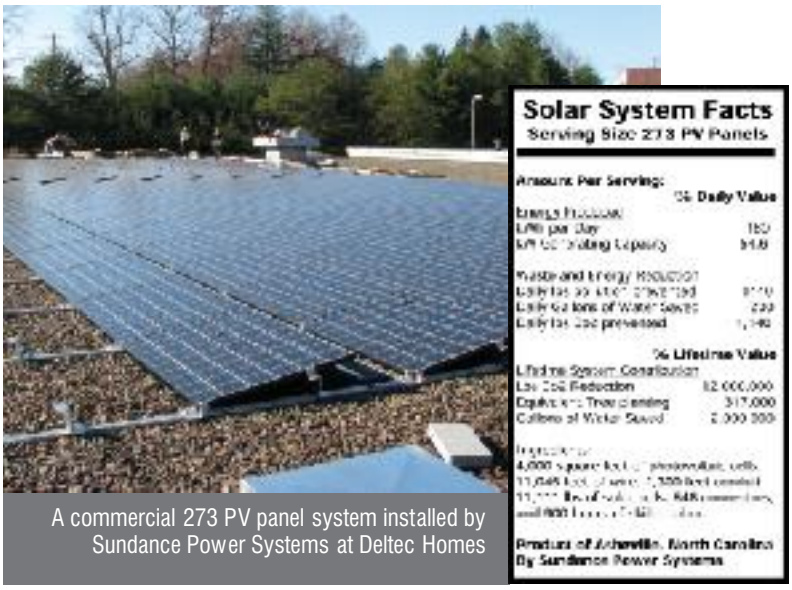
Matt Siegel is director of the WNC Green Building Council. He can be reached at matt@wncgbc.org or at (828) 254-1995. Michael Shore is president of FLS Energy.



A 144 PV panel residential system installed by Sundance Power Systems

Solar hot-water system installed on hotel by Biltmore Hilton

Solar thermal pool heating at YWCA in Asheville



A commercial 273 PV panel system installed by Sundance Power Systems at Deltec Homes

Out with the old windows

Replacing windows at home

by Matt Siegel

In older homes in wintertime, windows are often one of the largest sources of heat loss, due to their low insulating ability and high air-leakage rates. In the summer, windows are also generally the major source of unwanted heat gain. Besides improving the energy efficiency of the home, replacing old windows with new ones can enhance home comfort, eliminate winter condensation on the glass, reduce fabric fading and, in some cases, reduce the size of heating-and-cooling equipment needed.

The two most important window characteristics are U-factor and Solar Heat Gain Coefficient. U-factor relates to the window's ability to retain heat, and the SHGC relates to the window's ability to keep solar gain out. In both cases, the lower the rating, the better the window performance. Many new windows have the U-factor and SHGC printed right on them.

Replacing existing windows in a cost-effective manner:
Replacing the windows in a home is not always cost effective in a mixed-humid climate. Jalousie windows, metal-framed windows and single-paned windows in poor condition are the most likely candidates for replacement. The entire window unit (sash, frame and trim) need not be replaced in order to reach the desired U-factor and SHGC. Instead, sash kits can be used, usually at a lower cost than replacing the entire unit.

	Single-paned, metal-framed	Double-paned, metal-framed
U-Factor	1.25	.79
SHGC	.76	.68

	Double-paned, wood-framed	Double-paned, Low-e, wood framed
U-Factor	.49	.36
SHGC	.56	.38

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Energy tax credits extended

Making sense of the latest tax credits

by Matt Siegel, with assistance from Chad Storck and information from the N.C. Solar Center

Residential tax credits

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 (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 due on this amount would be $7,500. Then you would apply the credit and only owe $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.

Solar credit: With the extension of tax credits, now is a great time to contact a local installer for renewable-energy systems. *photo coutesy of Sundance Power Systems*

What tax credits are available for residential renewable energy?

The federal government offers a 30 percent tax credit for solar equipment, fuel-cell and microturbine property, small wind-energy systems and geothermal heat pumps. This credit has been extended until 2016.

Updates to this credit are:
- In 2008, there was a $2,000 cap on qualified solar-electric and solar-water-heating property. Now, there is no cap on solar-electric systems.
- Geothermal heat pumps are now eligible for this credit up to $2,000.
- Wind is eligible at $500 per .5kW up to $4,000.
- Tax credits are now able to be taken against Alternative Minimum Tax (AMT).

Plus, for renewable-energy property that serves a single-family residential unit, North Carolina offers a 35-percent tax credit of up to $1,400 for water heating (pool heating included); $3,500 for active- and passive-solar space heating and combined active space/hot water systems; and $10,500 per installation for photovoltaic, wind and hydroelectric systems. The credit must be taken for the taxable year in which the property is placed in service and cannot exceed 50 percent of the taxpayer's liability reduced by the sum of all tax credits. Any unused credit may be carried forward for 10 succeeding years. This credit expires in 2010. However, if the renewable-energy property for which a credit is claimed is disposed of, taken out of service, or moved out of N.C., the credit expires and the taxpayer may not take any remaining installment of the credit, except for that portion of an installment that accrued in a previous year and was carried forward.

What kinds of tax credits are available to builders and developers 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 in heating and cooling than the 2004 International Energy Conservation Code (IECC). This credit is available per home and is a part of the general business credit. This credit has only been extended through the end of 2009. The credit also applies to manufactured homes and provides for either a $2,000 or $1,000 credit, depending on whether the home is 50 percent or 30 percent more efficient than the IECC.

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.

What kinds of tax credits are available for home energy efficiency for homeowners with existing homes?

Federal energy-efficiency tax credits are available to homeowners for a variety of upgrades. These credits expired in 2007, which means they are not available for 2008 expenditures. However, the credits were reinstated for the 2009 calendar year, so this upcoming year is a good time to consider purchasing improvements. Keep in mind that there is a $500 limit on the combined credit for any of the following upgrades.

• Exterior windows: 10 percent of the total material costs up to $200
• Criteria: Must be Energy Star qualified or meet 2000 IECC.

• Insulation, storm doors, exterior doors, air sealing, Energy Star roofing: 10 percent of the material cost up to $500
• Criteria: Insulation, storm doors, exterior doors and air sealing must meet 2000 IECC. Roofs must meet Energy Star criteria.

• Central AC, heat pump, water heater: 100 percent of total installed cost up to $300
• Criteria: For qualifying criteria, visit www.energytaxincentives.org.

• Furnace or boiler: 100 percent of total installed cost up to $150
• Criteria: Must have an AFUE of >95 percent.

Other financial incentives for energy-efficient homes include:
• $500 permit fee rebate from the town of Black Mountain
• $100 fee rebate for Energy Star homes and an additional $100 for HealthyBuilt Homes from the City of Asheville
• $400 rebate to builders for Energy Star homes from Progress Energy

Commercial tax credits

What tax credits are available for commercial renewable-energy systems?

The 35-percent N.C. 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, and it must be taken over a five-year period. For commercial business properties, there is a $2.5 million limit on tax credits taken in N.C., and it cannot exceed 50 percent of the taxpayer's liability.

The federal tax credit of 30 percent applies to renewable-energy technologies, including PV, solar hybrid lighting and solar thermal for electricity generation, process heat, space heating and water heating (passive solar systems and solar pool-heating systems are not eligible), wind turbines up to 100 kilowatts in capacity and fuel cells. There is also a 10 percent tax credit for geothermal energy property, including geothermal heat pumps.

The following caps on tax credits apply to the federal credit:

1. There are no caps on eligible solar equipment.
2. There is a maximum credit of $4,000 for small wind systems.
3. The credit for fuel cells is capped at $1,500 per 0.5 kw of capacity.
4. For geothermal systems, the credit is equal to 10 percent of expenditures, with no maximum credit limit.

The other major tax incentive for commercial installations is the accelerated depreciation on the solar equipment (MACRS).

Below is a breakdown of the potential economics for typical commercial PV systems, spread 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 tax credits are available for commercial building energy efficiency?

There is currently a federal tax deduction for $0.30 to $1.80 per square foot for energy-efficient commercial construction, depending on technology and amount of energy reduction. For more information, visit www.efficientbuildings.org. This credit has been extended through the end of 2013.

For complete details on the tax credits, visit www.dsireusa.org.

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.

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Wind energy blows into WNC

A roundup of wind projects

by Brent Summerville

A fast-growing wind industry is sweeping across the country, leaving in its wake a new clean-energy infrastructure, impressive economic growth and new high-quality jobs. The U.S. Department of Energy has recently published a report that lays out a plan for wind power to produce 20 percent of our electricity by 2030. The plan shows North Carolina as a strong player, with contribution from wind turbines of all sizes in the mountains, along the coast, in the sounds and off-shore — while requiring no major upgrades to our electrical grid. The windy mountains of Western North Carolina play an important role in this growth, as demonstrated by recent developments in both large- and small-scale wind-energy technologies.

Large wind turbines for our mountain communities

In WNC, wind developers are currently working in the early stages of utility-scale wind-project development. Land owners with large tracts of accessible windy ridge-top land located close to the electrical grid yet outside of sensitive ecosystems and viewsheds are being contacted with land-lease proposals. Once an agreement is made with the land owner, local government will be contacted, public meetings will be held, and wind-resource assessment efforts will begin. No projects have yet been announced in WNC.

Communities, universities and towns are also exploring small-scale projects using one or more medium- to large-scale wind turbines. Jiminy Peak, a ski resort in Western Massachusetts, installed a single 1.5-megawatt wind turbine from GE (manufactured in Greenville, S.C.) that is producing about 33 percent of their electricity — equivalent to powering more than 400 homes. Using student funds from the Appalachian State University Renewable Energy Initiative project, ASU is planning an on-campus installation of a 100kW wind turbine.

Big jobs in big wind

Along with 45 percent growth in the U.S. wind industry in 2007 came continued expansion of the associated supply chain. The PPG plant in Shelby recently announced a $20.5 million expansion to their fiberglass plant, which supplies materials for wind-turbine blades. The expansion was needed to meet growing demand and will bring 120 new jobs. Manufacturing facilities are typically located near wind-project development, so the best way for WNC to continue to play a strong role in supply-chain component manufacturing is to bring wind projects to the mountains, creating a new wind-centered industry that brings new jobs and economic development to the region, as well as locally produced clean power.

Small wind turbines for homes and farms

The Emergency Economic Stabilization Act, which passed in Congress in October 2008, also contained a new federal tax credit for small wind turbines of $1,000 per kilowatt of rated power — up to $4,000. The new incentive, with the existing N.C. 35-percent state tax credit, will help bring down the upfront cost associated with investing in a small wind-energy system for a home, farm or business in WNC.

ASU Energy Center sees a lot of interest in small wind, as it sends out a steady stream of reports to interested landowners in the 24 mountain counties. Turbines are being installed throughout the region. The most recent installation was a 2.4kW Skystream from Southwest Windpower in Ashe County, installed by Asheville's Solar Dynamics. The Mountain Valleys RC&D in Madison County was recently awarded a grant from the Appalachian Regional Commission to install small-scale wind turbines at several county schools, as well as introduce wind energy into the school curriculum.

Small wind can be very rewarding: Enjoy energy security by creating your own electricity, become more connected to weather patterns and the rhythm of the seasons, and interact with your community by hosting curious visitors wanting to learn more about your efforts in sustainability. In an April/May 2008 *Mother Earth News* article, "Choosing Renewable Energy," author Wendy Milne says, "The aesthetics of wind turbines are irresistible, and we steal a glance at ours almost every time we walk between the house, garden and workshop."

Not your grandpa's windmill: Wind energy could mean jobs and energy for WNC. *photo courtesy of Appalachian State University Energy Center*

WNC to play a big role

As the U.S. moves toward a goal of generating 20 percent of our electricity from wind energy by 2030, our region can benefit greatly, thanks to our abundant wind resources and a growing public demand for clean energy and energy security. To become more involved, watch for public forums, wind workshops and meetings hosted by the N.C. Wind Working group.

Resources:

- www.windpoweringamerica.gov
- www.awea.org
- wind.appstate.edu
- www.homepower.com
- green.jiminypeak.com

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The art of deconstruction

An alternative to demolition or landfilling

by Paul Reeves

The demolition numbers

In the United States, it is estimated that 10 to 25 percent of all solid waste entering the waste stream comes from construction and demolition. Experts estimate that 80 to 90 percent of demolition waste could be reused or recycled. The increase in costs associated with sending materials to the landfill, coupled with an ever-increasing number of landfill regulations, has driven the search for new and creative ways to keep these materials out of the waste stream.

Good stuff: Deconstruction keeps useful items out of the landfill.
photos courtesy of Habitat for Humanity

What is deconstruction?

The relatively new deconstruction industry is being looked at as a tool for reducing the flow of demolition debris to our landfills. Deconstruction is generally defined as the process of disassembly or "unbuilding." Work is typically done by hand in a controlled process that lends itself to the careful separation of reusable and recyclable materials from materials that will ultimately go to the landfill. Deconstruction projects range in scope, and may include the removal of materials in preparation for remodeling jobs, "cherry picking" of usable building materials prior to demolition, and complete hand disassembly of structures — all with an eye towards keeping the maximum amount of material out of the landfill.

Who does it?

While a relatively small number of for-profit deconstruction companies have sprung up across the country to address the need for this activity, a larger number of nonprofit organizations are getting involved in the deconstruction industry. In North Carolina, Habitat for Humanity affiliates have played a leading role in providing deconstruction services. For a number of years, Habitat for Humanity resale stores across the state have raised money for their building programs by selling donated and reclaimed building materials. Habitat affiliates in Wake County, Charlotte and Asheville, among others, have launched successful deconstruction programs that provide a full range of benefits — not just for the affiliate, but also to the communities that they serve.

What are the benefits?

The benefits of deconstruction versus demolition are far reaching and include:

- The diversion of reusable and recyclable building materials from the landfill
- Providing a source of good quality, affordable building materials for reuse in the community
- The creation of new living-wage jobs in the community
- Providing funding for nonprofit missions in the community
- Salvaged materials can represent a tax-deductible contribution to charity and/or be used toward points for various green-building certifications

How do I get involved?

If you are an individual or a business, a contractor or a developer, an architect or a designer, and you are embarking on a remodeling or demolition project, please contact your local Habitat for Humanity to see if they offer any deconstruction services. If they don't, perhaps they'll be able to refer you to an organization that does. Everyone benefits when deconstruction is included as a part of the project plan.

Taking the time to save it: Deconstruction also means being a little more careful when removing building materials that can be reused, such as hardwood flooring.

Deconstruction efforts can have a real impact on a community. Let's all work toward making the incorporation of deconstruction into project plans the rule rather than the exception!

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Choosing the "greenest" wood

Making sustainable choices in wood products

by Boone Guyton

Wood choices: Choosing the greenest woods can result in sustainably built, beautiful homes.
photos courtesy of Jade Mountain Builders

A woody dilemma

I was looking out at the view from our Candler home at a ridge that had been partially clear-cut, and it inspired me to become serious about reducing the board feet of wood used in our home-building business. It felt hypocritical to criticize someone for harvesting the trees in my view, while at the same time demanding wood from the builders' supply, which in turn had once been in someone else's view.

One of the basics of green building has always been the use of sustainable materials. Wood is a renewable resource — as long as it comes from a source that is managed for sustainability. There has been a lot of attention given to forests, both as sources for human consumption and for the essential services they provide to the ecosystem. We now realize our forests must be healthy if our planet is to sustain and support us. According to the N.C. Department of Environment and Natural Resources, "We rely upon our forests for a wide variety of resources, we value them for a range of social and cultural reasons, and they are an essential component of a healthy planet."

What is forest health?

Think of a forest as a tree-dominated community of plants, animals and microorganisms. These living beings interact with each other and with the soil, water and the climate, DENR scientists explain. When the community is healthy and properly managed, trees, for example, provide such benefits as protecting soil from erosion, reducing runoff and improving water and air quality.

There is a growing awareness of the need to maintain healthy forests while providing wood products for humans, both now and for future generations. The predominant third-party certification system is the Forest Stewardship Council. FSC certifies that the wood in a product has been sustainably produced. Key FSC principles include the protection of forest watersheds, soil and indigenous species, as well as restrictions on chemical use and limits on genetic engineering and ensuring that fair-labor policies are upheld and local populations have influence over forestry operations.

More than 100 million hectares of forest distributed over 79 countries worldwide were certified to FSC standards in April 2008. Products that are FSC certified show up in Home Depot and Lowe's stores regularly, though getting entire framing packages for home building is still difficult. There are also other certification programs, such as the American Forest and Paper Association's Sustainable Forestry Initiative, which was started by the forest industry in response to FSC, but is not based on a required third-party audit.

Reduce

The principles of reducing, reusing and recycling can be applied to the use of wood in home building. According to the National Association of Home Builders, the average home in the United States is 2,330 square feet, up from 1,400 square feet in 1970, and uses about 17,000 board feet of lumber or about 85 trees. Reducing the size of a house and simplifying the geometry is the easiest way to reduce the embodied energy overall and the board feet involved in the construction.

In residential construction in North Carolina, wood framing is the predominant method of home building, and there are specific ways this wood can be used more efficiently. Optimal value engineering or advanced framing techniques can reduce the board feet in the framing of a house by 11 to 19 percent. Replacing large dimensional lumber with engineered lumber like roof trusses, floor trusses, I-joists and micro-laminated beams reduces the board feet used by substituting engineering for material. There are also structural insulated panels, which greatly reduce the amount of board feet in the building envelope. Stressed-skin panels can save between 25 and 50 percent of the framing lumber used in a typical house.

There are also methods, such as insulated concrete forms, that substitute concrete for wood framing in an insulated, stay-in-place form. These have embodied energy costs, but must be considered when looking at alternatives to wood.

Recycle

There are options for recycled and reclaimed wood from companies that deconstruct buildings and mill the wood into new products, as well as companies that salvage wood that had been lost in shipping years ago and can be recovered from the bottom of rivers. One example is Old Growth Riverwood from Wilmington, N.C. Often there are opportunities to deconstruct or salvage from local buildings, if you have

the time to work at it. We once used wood from an old bowling alley to construct the countertop in a house.

Buy local wood
Probably the best wood choice is the sustainably managed, locally sourced wood. We are fortunate to have many local sawmills in our area, some that are stationary and some portable mills that will bring the saw to the site. Then, there are kilns to dry and mills to manufacture the wood into finished products from flooring to moldings. There is more scheduling and time involved in seeing the process through from standing tree to finished wood, but the unique and unquestionable sustainability of the products that employ local people is an important added value.

Also, local wood has much less embodied energy from transportation. We have used local walnut, cherry, poplar, Virginia pine and locust for moldings, flooring, decking and cabinets. Take note: There is a new business in town, the Asheville Treecyclers, whose mission is "to cooperatively and sustainably utilize our downed urban trees; to provide locally grown and manufactured sustainable wood products; and to work cooperatively to further the awareness and practice of sustainable urban forestry in our community."

Choose your decking: Here's an example of locally milled locust.

Turning what was otherwise a waste product or destined to be ground to mulch into a higher-value product is an innovative solution — much like turning restaurant grease into bio diesel. Making choices about wood use and wood products impacts our ecosystems, and good choices contribute to the sustainability of our forests. You'll find many local businesses that are part of the solution in this directory.

Resources:
- www.fsc.org
- www.sfiprogram.org/index.html
- www.nrdc.org/cities/building/rwoodus.asp
- www.oldgrowthriverwood.com
- http://treecyclers.org

Boone Guyton is a partner in Cady and Guyton Construction, a HealthyBuilt Home builder. He is also a founder and current board member of the WNC Green Building Council.

Choosing green materials

How to determine what's green and what's not

by Maggie Leslie

Salvaged is a good thing: Both the furniture and the flooring in this foyer were made from salvaged, recycled wood.
photos by Jonathan Welch

Start with simple criteria

There are so many products and companies out there that claim to be green, it can be difficult to tell which products really are green and which are not. The truth is, there aren't many products that are completely sustainable. Instead, we have to base our decisions on a list of criteria. The *Environmental Building News*' Greenspec® directory suggests several basic categories, and I have added a few others worth considering, including products that:

- are made with salvaged, recycled or agricultural waste
- conserve natural resources
- save energy or water
- reduce toxic emissions and contribute to a safe healthy indoor environment
- are locally manufactured products
- support fair-trade practices
- are carbon neutral and/or minimally packaged

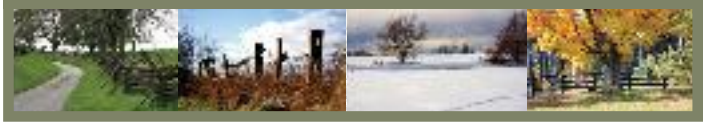
A great way to assess the true impact of a product is to look at it in terms of a life-cycle assessment, which analyzes the product from resource extraction through production, use and disposal. According to Greenspec®, a life-cycle assessment is "the science of examining the environmental and health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

Products made with salvaged, recycled or agricultural waste

This category comes first because it is always better to reuse and recycle existing products before creating new ones. Considering that buildings create 136 million tons of construction and demolition waste in the U.S. per year (approximately 2.8 pounds per person daily), efforts to reuse and recycle could have a huge impact on reducing waste.

Salvaged flooring, for example, is beautiful, and it adds character to a home that new materials could not. Some products can reduce the need for other products. For instance, concrete floors can be stained to look very attractive, and there is no need for an additional layer of material.

Next, look for recycled-content materials. Post-consumer recycled content means the waste used can no longer be used for its original intended purpose, such as carpet made of old soda bottles. Pre-



consumer or post-industrial both mean waste diverted during the manufacturing process. Whenever possible, choose post-consumer over post-industrial materials.

Products that conserve natural resources
Products made from rapidly renewable materials are the next best options. These materials can be harvested, and they renew themselves quickly (typically in less than 10 years) — unlike hardwoods, which can take hundreds of years to return, if ever. Cork and bamboo floorings are examples of products made from rapidly renewable resources (though the products are shipped great distances, and some processing methods are not environmentally friendly).

Some lumber has been third-party certified to indicate it has been sustainably harvested. The two most common certifications are Forest Stewardship Council certified and Sustainable Forestry Initiative certified. The latter is second-party certified, not third, and is currently not recognized as a sustainably harvested wood by the U.S. Green Building Council's LEED standards, though SFI is a good option if FSC is not available.

Durable products are also in the "natural resource conservation" category. If you build the greenest home in America, and it rots from moisture problems and then the materials are sent to the landfill, the world is no better off. This is why some people consider even vinyl siding to be a green product. It is toxic to produce — with a high "embodied energy" (meaning it's energy-intensive to manufacture) — and it may never biodegrade, but it is very durable and low maintenance.

Bark on the side: One oft-discarded byproduct of the milling process is bark, used here as siding on a net-zero-energy house.

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

Products that reduce toxic emissions and contribute to a safe, healthy indoor environment
Natural and minimally processed materials typically have less chemical additives that pose a threat to human and environmental health. For example, formaldehyde is common in many engineered products because it acts as a binding agent, but there are increasing efforts to replace it with less toxic agents and methods. A manufacturing plant in Old Fort, N.C., for example, provides a local source for cabinet-grade formaldehyde-free plywood.

Almost every chemically based product, from paints to adhesives, is now available in a low-VOC (volatile organic compound) version. Furthermore, there are natural and locally manufactured products available. GreenSeal is a third-party certification to look for; it's available on many products, such as paints and finishes. Additionally, Scientific Certification Systems has certified many low-toxic materials through its Environmentally Preferable Products and Sustainable Choice certification programs. Filtration products that can reduce indoor-air pollution are also in this category. In addition to GreenSeal, look for Greenguard certification on products such as insulation, Green Label certification on carpets and the SCS indoor-air certifications on flooring and furniture.

Fair trade, fair wage, carbon neutral and local
This category may come last, but it is certainly not the least important. Many green materials fulfill the environmental tenant of the definition of sustainability, but true sustainability addresses social and economic sustainability as well. Purchasing products that are produced by companies that pay workers a fair wage and/or that support our local economy means growing a sustainable economy and a sustainable community. Plus, locally produced products help cut our carbon footprint by reducing the impact of transportation and support our local economy.

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

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

Spray foam: saves energy, contributes to a healthy indoor environment
Blown cellulose: saves energy, recycled content, avoids toxic emissions
Recycled blue jean batts: saves energy, recycled content, avoids toxic emissions, local
Formaldehyde-free fiberglass: saves energy, some recycled content, avoids toxic emissions

Now apply these criteria to the needs of your own home. Could moisture be an issue, or are you worried about drafts? Consider

spray foam insulation: It creates an airtight envelope and inhibits mold growth. Are you most concerned about your environmental impact? Consider recycled blue jean batts: There's one brand manufactured in Hickory, N.C. Too expensive? Consider cellulose: It's recycled and easily installed.

Unfortunately, when it comes to green products, there are few perfect ones. But by considering the impacts of your choices, you can reduce the impact on the environment substantially, plus create (or renovate) a healthy and unique home.

Resources:

- *Cradle to Cradle: Remaking the Way We Make Things* by William McDonough and Michael Braungart (North Point Press, 2002)
- Life-Cycle Assesment: www.epa.gov/ORD/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
- *Environmental Building News*, "Behind the Logos: Understanding Green Product Certifications," January 2008
- www.scscertified.com/ecoproducts/index.html

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Natural wall covering: Think beyond wallpaper, and use natural materials, such as the jute fabric used here.

Greenspec® product standards at a glance

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

Products that conserve natural resources
- Products that reduce material use
- Products with exceptional durability or low maintenance
- Rapidly renewable products

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

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

Greenings from town hall

WNC governments pursue green-building initiatives

by Margaret Williams

Start small, think big: Green-building projects rely on town officials, including Black Town Manager Mary Onieal, Mountain Planning Director Elizabeth Teague, Town Clerk Shirley Raines, Building Inspector Dan Cordell and Fire Insprector Spenser Elliot. *photo by Jonathan Welch*

Cities and towns all across Western North Carolina have seen the green light. More and more green-building concepts have become commonplace and a regular part of the permitting, designing, planning and other processes that make it a reality.

There are HealthyBuilt Homes initiatives under way in a number of towns, including Cherokee, Asheville and Black Mountain. These three are also actively conducting energy audits of their buildings, as well as implementing green-building standards and stepping up efforts to educate both residents and building professionals. Particularly in the permitting processes, several WNC towns have implemented financial incentives for green builders. And the WNC Green Building Council received a grant from the state energy office to create a model for helping small communities, available to towns throughout North Carolina.

It's been a collaborative effort and an educational one, says Elizabeth Teague, Black Mountain planning director. "Early on, there was political leadership that was supportive of environmental issues," she reflects, mentioning the town's 2004 Master Plan. The shift toward green-building principles had its companion efforts in plans to make the town more pedestrian friendly, improve and protect its water quality, and other goals in the plan. There was also a growing level of interest for preserving the beauty and health of the environment in WNC, she continues.

Similar notions had been at work in Asheville, too: Former Mayor Leni Sitnick's green initiatives in the mid-1990s, the City Council's subsequent endorsement of sustainability principles, and the growth of the local "green" industry.

Helping tie it all together with national, state and industry efforts was the 2001 founding of the WNC Green Building Council. The nonprofit helped bridge the gaps between sustainable goals and sustainable practices.

For example, the council secured grants for holding contractor workshops on solar-hot-water systems, tax incentives and more, says Teague. Education was crucial, she argues. "It's important to get the word out [that] green building isn't just the 'cool' thing to do, but that it also makes economic sense."

Black Mountain and other local governments can be a resource for eco-friendly builders, contractors and residents who often come to them first for information, she points out. In one initiative, the town set up a collection site at town hall for old incandescent light bulbs, in an effort to educate people and encourage the switch to more efficient fixtures. When a downtown business proposed installing solar panels, town staff realized it interfered with historic-building ordinances: The conundrum led to a revision of the ordinance and a practical way to locate the panels without affecting the building's historic nature.

"We have to be good stewards ourselves, too," says Teague. She mentions that the Land-of-Sky-Regional Council's Waste Reduction Partners program performed energy audits on all town facilities and that town staff installed a solar panel to power the fire and police department's radio tower. "To be green, you have do a little bit of a lot of things," says Teague.

That notion may be behind the Cherokee Preservation Foundation's

push to fund and assist with sustainability projects. In its short history, the nonprofit hasn't seen a large number of proposals that focused on environmental issues in and around the Qualla Boundary, so its leaders decided to generate more interest, says Ethan Clapsaddle, program director.

Some of the initiatives include the tribe's Housing and Community Development Division's goal of incorporating green-building standards as it redefines its building codes. There's also a Go Green Team, composed of tribal youth "charged with identifying the critical environmental issues facing the tribe and [developing] action plans aimed at addressing [them]," Clapsaddle reports. The foundation also funded energy audits of 20 tribal facilities, in partnership with Waste Reduction Partners. The Green Building Council has also worked closely with the Cherokee Qualla Generations group to work toward an overarching requirement that new buildings on the Boundary are built green.

Energy audits are a good place for anyone to start, says the city of Asheville Energy Coordinator Maggie Ullman, adding, "The best way we can help citizens is to clean up our own house first." In other words, lead by example. When she was hired in 2007, her position was a new one for the city, but there were already signs of green initiatives at work: Several sustainability project were well under way, such as the conversion of some of the city's vehicle fleet to electric and hybrid models. The project took the additional step of installing one of the region's first compressed-natural-gas fuel stations, Ullman points out.

Last year, the city stepped up its effort, announcing a goal of reducing its carbon footprint by 80 percent by the year 2050, Ullman continues. A first step was increasing efficiency, and the logical place to start was with city buildings and facilities, she says. "They're a big opportunity, because that's where we emit 20 percent of our energy," Ullman mentions. Right off the bat, Ullman called on city staff in all departments to report ways that they were already striving for sustainability — and to look for new ways to be more efficient and more environmentally friendly. Energy audits of city buildings are also showing other opportunities for saving money and reducing that carbon footprint, says Ullman.

And this summer, when gas prices skyrocketed, 150 employees in the Public Works Department switched to a four-day, 10-hours-per-day work schedule. Ullman says it has been a great morale booster and money saver for employees, as well as for the city and the environment: She estimates that the program reduced greenhouse-gas emissions by about 250 tons annually, along with an estimated 13 percent reduction in the department's building energy use (worth more than $3,000 during the initiative's first three months).

Part of the sustainability equation means being practical, too, adds Marcy Onieal, Black Mountain town manager. A few years ago, she recalls, town leaders determined that they needed more room: Should they build a new town hall or rehab an existing structure? The town bought an existing 1970s building that had been a day care and the local headquarters for Carolina Power and Energy (now Progress Energy). Town leaders wanted to follow green-building principles at every step of the renovation process for the 6,700-square-foot building. But there was one catch, Onieal says. "We had a fixed amount of money."

Early on, that limitation meant preserving as much of the building's structure and equipment as possible. "The ultimate green idea is re-using what's already here," says Onieal. The building had an existing drive-up window, which has been retained, and little has been done to change the exterior, she adds. Despite starting out with the notion of keeping the existing light fixtures, however, they switched to newer, more energy-efficient ones equipped with sensors that turn them off on bright sunny days. The structure was already well insulated, so only a few extra touches were needed to fill some gaps, Onieal continues.

The heating-and-cooling system was another matter. The existing unit wasn't going to meet town-hall efficiency goals, but it was still useable. It was removed and installed at the Grey Eagle Arena, which had never had air conditioning before, Onieal mentions. The choice for town hall? Install the second commercial geothermal system ever done in Black Mountain. "We looked at solar, but [this shady site] is not a good one, and we won't be using much hot water," says Onieal. The geothermal wells were drilled in the parking lot area.

"It's all about making decisions," says Teague. Re-using and retrofitting existing structures for sustainability requires a little homework but shows that the principles aren't limited to new construction or choices that are expensive up front, she argues.

Then there's an unexpected side benefit. Says Onieal, "The process of asking questions [in our town-hall process] made me question what I'm doing at home." Her house is already solar passive, but as a result of the town-hall project, she's ready to install a residential geothermal system.

All these efforts support Ullman's point. "You don't have to be a card-carrying environmentalist [to practice sustainability]. It's important to take little steps," she says. "The biggest opportunities are in changing human behavior — turning off the lights when you leave a room, not leaving computers on," Ullman notes. She emphasizes, "The only way to make changes globally is if everyone finds a place where being green works for them."

Margaret Williams is contributing editor at Mountain Xpress*, and writes a weekly environmental news column for the newspaper called "Green Scene." She can be reached at mvwilliams@mountainx.com or at (828) 251-1333, ext. 152.*

A Different Shade of Green Home Builders

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GO! for green-collar jobs

Green Opportunities solves two problems with one solution

by Rebecca Bowe

Green-collar apprentice: Nicole Brow is one of eight young adults undertaking a 15-week program of environmental-service projects. *photos courtesy of Asheville GO!*

It's no surprise that GO!, the acronym for Asheville's budding green-jobs training initiative, has an urgent ring to it. The Asheville Green Opportunity Corps pilot program was created as a local response to two pressing issues: climate change and a dearth of desirable jobs for disadvantaged youth. By opening doors to green jobs, the program aims to promote sustainability and social justice at the same time.

Since the September 2008 inception of its pilot program, GO! has been preparing eight young adults for careers in the budding environmental sector. The corps members — many of them public-housing residents who did not possess high-school diplomas when they started — are paid to participate in the program, which covers everything from basic interviewing skills to GED preparation to environmental education. After 15 weeks of environmental service projects, life-skills training, community-college coursework and one-on-one support, corps members go onto a 20-week paid apprenticeship in the green-career pathway of their choice.

The experience will help them gain access to jobs that — aside from being a boon to the environment — offer living wages, benefits and opportunities for advancement. The program is deeply interconnected with Asheville's green-business community, which stands to gain from the specialized workforce created through the program. GO! works closely with green businesses and nonprofits that agree to host apprentices, and the companies benefit from the extra publicity.

GO! was created by ecologist/educator Dan Leroy and artist/activist

DeWayne Barton. (The program was administered by the Clean Air Community Trust initially, but is working toward its own nonprofit status.) A chief objective, according to its cofounders, is to get corps members to invest energy into their own communities during their immersion in service learning. Toward that end, corps members have completed 14 diverse projects in the first three-month period, from installing green roofs, solar panels and compact fluorescent light bulbs, to building energy-efficient affordable housing, growing local food and removing invasive species. They're now transitioning to the apprenticeship phase of the program.

Corps members say the program has given them new perspectives on the environment, green business and their own futures. "I love it," says corps member Nicole Brow, who is interested in apprenticing at a biofuels outfit. The GO! program, she adds, has helped her to develop a deeper appreciation of nature, and she's concerned about energy issues.

D. Franklin, another corps member, says the program has fueled his desire to start his own green-construction business. Franklin says he tells his friends to "shoot for the stars. If you're down, you don't have to stay down — cause there's always opportunity."

GO! is part of a growing green-collar jobs movement seeking to inextricably link economic prosperity and justice with environmental progress. Van Jones, founder of Oakland-based Green for All, articulates his vision for a prosperous green future in *The Green Collar Economy* (Harper Collins, 2008). In the book, he describes what he considers to be a new era of environmentalism: "This new wave has the potential to be infinitely more expansive and inclusive than previous environmental upsurges," he writes. "The reason for hope has to do with the very nature of the present wave: because it is centered on investment and solutions, it is a qualitatively different phenomenon."

He continues: "Once the green economy is no longer just a place for the affluent to spend money, [and] once it becomes a place for ordinary people to earn and save money — nothing will stop it."

The concept appears to have won support in some very high places. After a Dec. 9, 2008, meeting with former Vice President Al Gore, then-president-elect Barack Obama sounded a similar note on climate change. "This is a matter of urgency and national security, [but] it is not only a problem, it is also an opportunity," Obama said in a statement. "We have the opportunity now to create jobs all across this country in all 50 states to re-power America, to redesign how we use energy and think about how we are increasing efficiency to make our economy stronger, make us more safe, reduce our dependence on foreign oil and make us competitive for decades to come — even as we save the planet."

If GO! sees the work necessary to fight climate change as a golden opportunity, they're not alone. And while the endeavor may have a way to go before saving the planet, it seems to be getting under way at just the right time.

To learn more about how you can support GO! as an Apprentice Host or Business Partner, contact Dan Leroy at (828) 318-9916 or at info@greenopportunities.org.

Rebecca Bowe, formerly contributing editor at Mountain Xpress*, is now based in San Francisco. She can be reached at rebecca.bowe@gmail.com.*

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Cracking the certification codes

Energy Star Homes, 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, certification programs have emerged to prevent greenwashing, and to provide a marketing edge for builders who are willing to make human health and environmental sustainability top priorities. In Asheville, there are three main certification programs for green building: Energy Star Homes, N.C. 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 National Environmental Protection Agency 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 the home 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. Additionally, Progress Energy, as of Dec. 1, 2008, offers a $400 rebate for any Energy Star-certified home with a 14 SEER or greater heat pump. The city of Asheville offers an additional $100 permit-fee rebate for 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 required to be a certified 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 (CFLS to solar hot-water systems), 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. In this way, builders are required to approach and improve all aspects of environmentally friendly construction. 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. With only four years since its inception, there are approximately 220 HealthyBuilt homes certified, and 700 currently under construction in WNC. Current financial incentives (in addition to the Energy Star incentives) include a $100 permit-fee rebate from the city of Asheville. If you are in the town of Black Mountain, you are eligible for a $500 rebate if the house is certified at the silver level.

LEED, Leadership in Energy and Environmental Design, 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 WNC Green Building Council currently works with the Southface Energy Institute in Atlanta to offer LEED for Homes certification services for homes in WNC. As of November 2008, 1,078 homes were certified across the U.S. There is currently one certified LEED home in WNC and six under construction. The program is less rigorous than HealthyBuilt in some ways and more rigorous in other ways; currently, the cost and documentation required is significantly greater, but it does offer the advantage of national marketing recognition.

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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Green-building glossary

compiled by Maggie Leslie

Air Barrier: A rigid material installed around a building frame to prevent or reduce the infiltration of air into the interior of a structure. (1)

Air Infiltration: Uncontrolled inward air leakage to conditioned spaces through unintentional openings in ceilings, floors and walls from unconditioned spaces or the outdoors. (2)

Autoclaved Aerated Concrete (AAC): This wall system is composed of large blocks of lightweight, fireproof, decay and insect-proof concrete material. The blocks are a mix of lime, sand, cement and water that is molded. Aluminum powder is added to cause the mass to expand. (1, 3)

Batt Insulation: The most common and widely available type of insulation. It comes in the form of pre-cut blankets or rolls and consists of flexible fibers, most commonly fiberglass, but is also available in cotton. It's held together with a binder. (10)

Building Envelope: The exterior surface of a building's construction: the walls, windows, floors, roof and floor. Also called building shell. (2)

Cellulose Insulation: A blown-in insulation material that is a mixture of waste paper and fire retardant. It has a high recycled content, no added formaldehyde and is blown in for easy installation around obstacles in the wall cavity. (2)

Combustion Safety: For health and safety, locate combustion appliances outside of the conditioned envelope or use sealed or direct combustion appliances. Provide carbon-monoxide monitoring. (3)

Daylighting: The controlled admission of natural light into a space through glazing with the intent of reducing or eliminating electric lighting. Daylighting creates a stimulating and productive environment for building occupants. (2)

Energy Modeling: Process to determine the energy use of a building based on software analysis. Can be used to provide a cost-benefit analysis for energy-efficient upgrades. (2)

Engineered Lumber: Composite wood products made from lumber, fiber or veneer, and glue. These products can be environmentally preferable to dimensional lumber, as they allow the use of waste wood and small-diameter trees to produce structural building materials, but can also increase offgassing into the home. (2)

Fly Ash: A fine, glass powder recovered from the gases of burning coal during the production of electricity. Fly ash can be used to replace a portion of cement in the concrete, providing some distinct quality advantages. (2)

Formaldehyde: A colorless, pungent and irritating gas. H2C0 is used chiefly as a disinfectant, preservative and in synthesizing other compounds like resins. It is the component of many types of glue in wood products and may cause respiratory problems. (2, 3)

Graywater Reuse: A strategy for reducing wastewater outputs from a building by diverting the graywater into productive uses such as subsurface irrigation, or on-site treatment and use for nonpotable functions such as toilet flushing. Graywater includes water from bathtubs, showers, bathroom wash basins, and water from clothes-washer and laundry tubs. (2)

Green Roof: Green roofs maintain living plants in a growing medium on top of a membrane and drainage system. Green roofs are considered a sustainable building strategy in that they have the capacity to reduce stormwater runoff from a site, modulate temperatures in and around the building, have thermal insulating properties, can provide habitat for wildlife and open space for humans, and provide other benefits. (2)

Ground Source Heat Pump: A heat pump that uses the ground temperature instead of air temperature to cool or heat a home. Usually this is accomplished with underground water pipes that transfer the ground temperature into the heat pump. (3)

Heating, Ventilation, and Air Conditioning (HVAC): General term for the heating, ventilation and air conditioning system in a building. System efficiency and design impact the overall energy performance of a home and its indoor environmental quality. (2)

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

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

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

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

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

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

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

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

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

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

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

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

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

Porous Paving: Paving surfaces designed to allow stormwater infiltration and reduce runoff. (2)

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

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

Radiant Floor Heat: A thermal mass floor with pipes laid underneath to transfer heat generated either by a solar collector or other type of liquid heating system. (3)

Radon: A colorless, naturally occurring, radioactive, inert gas formed by radioactive decay of radium atoms in soil or rocks. When trapped

in buildings, concentrations build up, and can cause health hazards. (1, 2)

Rainwater Catchment/Harvest: On-site rainwater harvest and storage systems used to offset potable water needs for a building and/or landscape (2)

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

Rapidly Renewable Materials: Material that is considered to be an agricultural product that takes 10 years or less to grow or raise and to harvest in an ongoing and sustainable fashion. Examples include bamboo flooring, biocomposite veneers, fiber-based finishes, wool and cotton insulation. (2, 3)

Recycled Content: The content in a material or product derived from recycled materials versus virgin materials. Recycled content can be materials from recycling programs (post-consumer) or waste materials from the production process of an industrial/agricultural source (post-industrial). (2, 3)

Salvage: Building materials diverted from the waste stream intended for reuse. Commonly salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick and decorative items. (2)

Seasonal Energy Efficiency Ratio (SEER): The measure of the energy efficiency for air conditioners and the cooling side of heat pumps. The higher this number, the better, with code being 14 SEER. (1)

Solar Electric Systems: Electricity producing systems that directly convert the sun's energy into electricity. Photovoltaic systems consist of solar panels, an inverter and controller, and are either off grid or grid tied. (1)

Solar Heat Gain Coefficient (SHGC): The fraction of solar radiation admitted through a window or screen, both directly transmitted and absorbed, and subsequently released into the living space. (1)

Solar Thermal Systems: Energy producing systems that gather the sun's radiant energy to heat air or water for use as domestic hot water or space heating.

Spray Foam Insulation: The insulation is applied as a liquid is sprayed through a nozzle into wall, ceiling, and floor cavities where it expands to fill every nook and cranny. Spray foam insulation makes it easy to completely fill wall cavities with insulation and to perform air sealing in the same step. (9)

Stormwater Management: To protect the local ecology and hydrology, limit and control stormwater runoff by providing for on-site storage and filtration. Pervious pavement systems, reduced amounts of impervious pavement (concrete, asphalt), rainwater collection, green roofs, rain gardens (bioretention) and constructed wetlands are methods to accomplish this. (3)

Straw-Bale Construction: Alternative building method using bales of straw for wall systems in place of standard construction materials. (2)

Structural Insulated Panel (SIP): Manufactured panels consisting of a sandwich of polystyrene between two layers of engineered wood paneling. SIPS can be used for walls, roof or flooring, and result in a structure very resistant to air infiltration. (2)

Thermal Mass: A mass (often stone, tile, concrete or brick) used to store heat and reduce temperature fluctuation in a space by releasing heat slowly over time. Used in passive solar design. (2, 3)

Universal Design: The design of products and environments that are usable by all people, regardless of age or physical ability, to the greatest extent possible, without adaptation or specialized design. (6)

Ventilation: The process by which outside air is conveyed to an indoor space. Energy-efficient homes must be air tight, but to maintain healthy indoor air it is necessary to provide controlled fresh air to the building interior at recommended rates. (2, 3)

Volatile Organic Compound (VOC): Carbon compounds that become a gas at normal room temperatures. This class of chemical compounds can cause nausea, tremors, headaches and, some doctors believe, long-lasting harm. VOCs can be emitted by oil-based paints, solvent-based finishes, formaldehyde-laden products and other products on or in construction materials. (2, 3)

Wind Power: Systems that convert air movement into mechanical or electrical energy. Driven by the wind, turbine blades turn a generator or power a mechanical pump. Wind generators include a tower and wind turbine, and can be off-grid or grid-tied. (2, 3)

Xeriscaping: Landscaping design for conserving water that uses drought-resistant or drought-tolerant plants. (2)

Sources:

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We're on the Green Beat

Every Wednesday in the *Mountain Xpress*, WNC's alternative newsweekly, we bring you The Green Scene, an environmental news column covering:

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- Endangered species and biodiversity
- Land conservation
- Environmental activism
- Energy alternatives
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- Sustainable living

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Choosing a green builder

The right questions for your green-built home

by Hans Doellgast

As people become educated about the benefits of building and owning a green-built home, more builders are advertising themselves as "green" builders. For the most part, this is a good thing. For those of us who have preached environmentally sensitive building practices for years, our voices have been heard. Now that our message has caught on, future green-home owners are presented with a large pool of builders to choose from.

The green-builder checklist: Ask the right questions, and don't let builders greenwash their answers, builder Hans Doellgast suggests. *photo by Jonathan Welch*

But when choosing your builder, make sure you pick one whose value system and priorities match up with your own. Building a home can be either one of the most satisfying projects you can take on, or it can turn into your biggest nightmare. Make sure that when interviewing builders you ask questions that reveal their shade of green! Here are some questions to consider asking prospective builders:

- What makes your company green? (If you only get a list of products, beware!)
- How long have you been building green homes?
- Can you tell me about the N.C. HealthyBuilt Homes program?
- What led you to go green?
- How many homes have you certified through the HealthyBuilt Homes program?
- What level of certification did your homes achieve?
- Do you actively use locally produced materials in your homes?
- What efforts do you go through to lessen the impact on your job site?
- Are your homes efficient? Why?
- Have you ever used alternative forms of technology to heat, cool or power your homes?
- Are your homes appropriate places for chemically sensitive people to live? Why? What changes could you make to achieve this goal?
- Do you have your own crew, and if so, are they paid a living wage?
- Do you employ Energy Star framing techniques, and if so which ones?
- Do you make an effort to keep certain building materials out of the landfill? How? Why?
- Do you provide fresh-air introduction to your homes? How? Why?
- What type of insulation do you typically use? Why?
- What sets you apart from you competition?
- Are there any new green products or technologies that you are excited about?
- Do you have a list of previous clients that I could call for references?

In my opinion, there are indeed wrong answers that perspective builders can give to most of these questions. Builders who are thrown off by any of these questions — or who consider a question to be unimportant — might not be your best choice. There are, however, quite a few correct answers to all of these questions. Approach each interview as an opportunity to educate yourself.

If a builder's response doesn't seem to make sense, or contradicts another builder's response, call the WNC Green Building Council's hotline at (828) 254-1995. Council staff members are an unbiased source and are available to help you negotiate your way through a dizzying array of products and services. The council also offers a variety of classes to educate both home buyers and builders. Current class listings are available at www.wncgbc.org.

Hans Doellgast owns Jade Mountain Builders, a committed HealthyBuilt Home company.

Smart selections: Buy local

Product transportation has major environmental impacts. Before buying a product, find out where it is produced. LEED gives credit for products extracted and manufactured within a 500-mile radius. There are plenty of materials available in our region.

Word Search. There are 39 green building words and phrases hidden below. Words go in any direction -- forward, backward, up, down, and diagonal.

R I T P X T M F D R W Q M R I G U P
J E B B A A O K A E C R U W B B K U
Z A S J P S I T N E T A L B B A Z R
K R L N R P S A M D X D L M M V I D
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Steve Linton is the green building coordinator at Deltec Homes and the BuildSmart Alliance. Friendly crossword banter is welcome at slinton@deltechomes.com.

For answers, visit www.wncgreenbuilding.com

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zach@bassettbuildersinc.com

BDWG Concrete Studio Inc.
Andy McDaniel
(828) 266-1599
Fax: (828) 297-1847
P.O. Box 188
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www.bdwgconcretestudio.com
info@bdwgconcretestudio.com
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land planning

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www.ambientdesigngroup.com
tony@ambientdesigngroup.com

Blackrock Surveying & Land Design, PC
Jamie Brady
(828) 225-4341
Fax: (828) 225-4342
143 Washington Road
Asheville, NC 28801
www.blackrocksurveying.com
jbrady@blackrocksurveying.com
Blackrock Surveying provides WNC with land surveying services, including topographic surveying for home or subdivision design, construction staking of home and site layout.

Equinox Environmental Consultation & Design Inc.
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www.equinoxenvironmental.com
david@equinoxenvironmental.com
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www.landformstudio.com
jmc@landformstudio.com
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mtssea@yahoo.com
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landscapers

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www.mountainbizworks.org
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tom.byers@self-help.org

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www.ncsecu.org/loans/greenmortgage.html
asheville-biltmorevillage@ncsecu.org

Introduction: Greening it forward

The WNC Green Building Council forges ahead

by Margaret Williams

Start small. Think big. Pass it on. Build on that foundation. This pay-it-forward idea might have started with Benjamin Franklin, who told an acquaintance not to pay *him* back for the money given, but to pass it along to the next person who needed it. "I hope it may thus go through many hands," Franklin told Benjamin Webb in 1864. "This is a trick of mine for doing a deal of good with a little money."

There's a strong dose of this spirit underpinning the Western North Carolina Green Building Council. In 2000, the organization was little more than an idea tossed about by six building professionals. They aspired to educate others on the health and environmental impacts of design and construction. That mission is well under way and gaining momentum each year.

In 2006, the council had 150 members. Two years later, that number had grown to 450. By early 2009, membership had risen to 550.

In 2004, the council partnered with state organizations such as the N.C. Solar Center to create the North Carolina HealthyBuilt Homes program, a statewide building-performance rating system that helps homebuilders establish truly green, high-performance, low-impact homes across the region. From a mere 19 homes certified in the WNC program in 2006, the program numbered 220 at the start of 2009. More than half those homes were certified in 2008. Another 700 are in the works, the council reports.

The WNC Green Building Council also became an official provider for the LEED for Homes program in January 2009 and is working on five homes in the program. The council's greening forward with its education programs, too: More than 850 people participated in its outreach presentations and class series this past year.

On-the-ground progress is also showing up in its partnerships. In a joint project between the council's carbon-offset program Appalachian Offsets, the Asheville Housing Authority and local businesses, student volunteers from the University of North Carolina at Asheville changed out a total of 13,000 incandescent light bulbs for compact fluorescent light bulbs. The effort will result in savings of more than $500,000 and five million kilowatt hours over the life of the bulbs; that means a reduction of 3,700 tons of carbon being released into the atmosphere.

Such efforts go a long way toward green building, or sustainable design. It's an attitude shift away from high-impact practices still prevalent in the building industry. Stormwater and erosion problems at construction sites can degrade streams. The wood used in construction may come from clear-cuts that ravage forest habitats. Some common interior products can emit harmful chemicals, such as the formaldehyde still used in many plywood/veneer adhesives or the volatile organic compounds released by many stains and paints. The green-building approach aims to show that it doesn't have to be done that way — and it doesn't have to be expensive.

For example, some of the first steps towards sustainability are increased efficiency, including exchanging incandescent lights for CFLs, weather stripping and caulking windows to prevent heat loss, or installing a $30 timer on your hot-water heater so it's only hitting peak temperatures when needed. Local nonprofits such as Asheville GO! train youth in such work, as well as the more technical tasks, such as installing solar panels. Local governments are catching on, too. As one town planner observed, her office has a tremendous opportunity to educate residents, builders and contractors, simply because so many of them come through town-hall doors looking for information and seeking permits.

And homeowners and business owners willing to do a little more — sometimes spend a little more and be out front a little more — are showing that sustainability can be accomplished. We can use energy, water and materials more effectively. We can have a gentler impact on human health and the environment, whether building a new home or renovating a business building.

Consider the Cherokee Central School Campus, a project that the Green Building Council helped along. With a silver-level LEED certification in sight, the 500,000-square-foot, 50-acre facility will open its campus to students in the fall of 2009. Or take a look at the net-zero-energy home owned by Yves Naar near Brevard. Or catch a glimpse of the solar panels popping up in the region — on top of Green Sage Coffeehouse and the YWCA in Asheville or spread across seven acres in Haywood County. And ponder the positive results that will come out of the council's efforts to get Habitat for Humanity and the Eastern Band of Cherokee certifying HealthyBuilt homes for low-income families.

These are signs that green building is coming of age.

Not content with that, of course, the WNC Green Building Council has planned an ambitious 2009. The council is developing a three-year strategic plan. Thanks to a grant from The Community Foundation of WNC, they're also busy planning two Asheville bus-stop shelters that demonstrate green-building techniques. They're developing and will pilot a Green Communities certification program, too.

Hopefully, some of the tips and stories in this directory will spark your own efforts to green it forward. The directory offers a mix of case studies, articles by professionals in the field, fact sheets, tips and — of course — listings of companies and individuals that can get you a step closer to sustainability.

For more information about the WNC Green Building Council, visit the Web site at www.wncgbc.org, or call (828) 254-1995.

Margaret Williams is contributing editor at Mountain Xpress, *and writes a weekly environmental news column for the newspaper called "Green Scene." She can be reached at mvwilliams@mountainx.com or at (828) 251-1333, ext. 152.*

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recycling

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renewable energy

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Re/Imagine. Re/Think. Re/Design. Re/Construct. A licensed general contractor specializing in residential and commercial renovations and additions.

S.B. Coleman Construction Company
Tom Israel
(828) 253-5391
Fax: (828) 251-5905
1000 Centrepark Drive
Asheville, NC 28805
www.sbcoleman.com
info@sbcoleman.com

Smart Builders Inc.
Gawain Mainwaring
(828) 252-4345
Fax: (828) 350-9608
2 Brucemont Circle
Asheville, NC 28806
www.thesmartbuilder.com
info@thesmartbuilders.com
An Asheville-area company building high-performance sustainable homes, additions and renovations. Specializing in SIPS and SIPS installation. Member BBB, SIPA and AHBA.

South Face Construction, LLC
(828) 226-1621
www.southfaceconstruction.org
info@southfaceconstruction.org
Specializing in passive solar designs and retrofits, commercial renovations, additions and decks. Sustainable land planning, including rainwater collection.

Stillwater Construction Inc.
Chad Vanne
(828) 674-6833
Fax: (828) 697-3395
P.O. Box 928
Hendersonville, NC 28793
www.stillwaterconstructioninc.com
stillwatercc@hotmail.com
Stillwater specializes in the construction and renovation of residential and commercial buildings using both energy- and resource-efficient building practices and systems.

Sunny Day Homes Inc.
Sam Zimmerman
(828) 265-4123
747 Rocky Creek Road
Boone, NC 28607
www.boonegreenbuilders.com
boonegreenbuilders@gmail.com
Small residential contractor doing both design and construction. Especially strong in additions and remodeling. Recently completed an NAHB-certified green custom home.

Sure Foot Builders Inc.
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11 Blanton St.
Asheville, NC 28801
surefootbuilders@gmail.com
Craftsmanship of balance: clean, strong, healthy projects to fit every need. Licensed residential and commercial contractor. Fully insured.

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Banner Elk, NC 28604
www.tsquarebuilders.com
travis@tsquarebuilders.com

WNC Remodeling, LLC
Romano Samarin
(828) 230-0813
12 Grassy Glenn Lane
Asheville, NC 28804
www.wncremodeling.com
wncremodeling@yahoo.com

residential designers

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devittdesign@charter.net
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Fax: (828) 264-8787
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Boone, NC 28607
www.highcountrytimberframe.com
tomo@highcountrytimberframe.com and scottc@highcountrytimberframe.com
A leader in custom timber framing, High Country Timberframe & Gallery Woodworking Co. strives to ensure that "the second life of the tree be as dignified as the first."

Old School Design~Build, LLC
Bobby McHugh
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320 Sassafras Lane
Black Mountain, NC 28711
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rebaloo@bellsouth.net
Work with Bobby McHugh, owner and WNC Green Building Council member since 2001, to create your next home or small project. Local materials, custom woodworking, Jap-alachian style, low cost.

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Kevin Ward
(828) 656-8291
Fax: (828) 656-8312
503 Old Farm Lane
Marshall, NC 28753
www.ecologicaldesign.net
info@ecologicaldesign.net
An ecological general contracting company and green design/build firm organized to approach land use, and build holistically and sensibly.

Studio Dionisi Inc.
Stephen Beili
www.ashevillemodern.com
stephen@ashevillemodern.com

Sustainable Designs Inc.
Seay Stephens
(828) 298-7636
904 Long Branch Road
Swannanoa, NC 28778
www.wncsustainabledesigns.com
sustainabledesign@pobox.com

The Lake James Design Studio
Allison Wilson
(828) 221-2021
Fax: (828) 221-0075
116 South Sterling St.
Morganton, NC 28655
www.lakejamesdesignstudio.com
info@lakejamesdesignstudio.com

Think Green Building
(828) 239-0215
729 Haywood Road
Asheville, NC 28806
www.thinkgreenbuilding.com
info@thinkgreenbuilding.com
Zero net energy design blending high-performance passive and active building science, natural materials and permaculture landscapes to foster joyful, sensible lifestyles.

roofers

Living Roofs Inc.
Emilio Ancaya
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Asheville, NC 28803
www.livingroofsinc.com
info@livingroofsinc.com
Living Roofs Inc's sole business is green roofs. We provide high-quality green-roof systems for commercial, residential and institutional structures.

Olde World Masters
Paul Wiederhold
(828) 277-6141
Fax: (828) 277-6142
9 Reed St., Suite C
Asheville, NC 28803
www.oldeworldmasters.com
oldeworldmasters@bellsouth.net

salvage

Asheville Area Habitat for Humanity
Paul Reeves
(828) 777-0743
Fax: (828) 251-0678
30 Meadow Road
Asheville, NC 28803
www.ashevillehabitat.org
preeves@ashevillehabitat.org
Habitat's Deconstruction program works to remove usable building materials from structures and sells them affordably in our Home Store. Proceeds build Habitat homes.

Asheville Treecyclers
(828) 450-1375
P.O. Box 8175
Asheville, NC 28814
www.treecyclers.org
info@treecyclers.org
Asheville Treecyclers transforms downed urban trees into high-quality wood products and works to further the awareness of sustainable urban forestry in our community.

sitework

Carolina Trailbuilders
Paul and Claudine Cremer
(828) 658-0294
Fax: (828) 658-0294
P.O. Box 809
Weaverville, NC 28787
www.carolinatrailbuilders.com
carolinatrails@verizon.net
Carolina Trailbuilders specializes in the design and construction of rolling contoured, sustainable hiking, mountain biking, ATV and equestrian trails, bridges and overlooks.

Mike Taylor Company, LLC
Mike and Barbara Taylor
(828) 669-9313
310 Stone Mountain Farm Road
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mtaylortrace@yahoo.com
Turning dirt into dreams! Home-site excavation, drives, septic, boulder walls, erosion control and site consultation for eco-friendly planning. Certified.

WNC Arborist
Mike Riley, ISA Certified Arborist
(828) 450-9298
1374 Charlotte Highway
Fairview, NC 28730
www.wncarborist.com
wncarborist@gmail.com
Providing professional Asheville-area tree care. Services include construction planning, hemlock woolly adelgid treatment, plant health care, pruning, and consultations.

structural materials

84 Lumber Company
Judy Dinelle
(828) 254-9584
Fax: (828) 667-3288
75 Montgomery St.
Asheville, NC 28806
www.84lumber.com
dinellej@2306.84lumber.com
84 is a full-service building material company. We are FSC-certified and offer a wide variety of products. We also offer a full-service installation program.

Appalachian Antique Hardwoods, LLC
(828) 627-0830 / Fax: (877) 817-7764
P.O. Box 167
Waynesville, NC 28786
www.aahardwoods.com
info@aahardwoods.com
A national leader in providing 130+ reclaimed wood and natural element certified green building products, including flooring, timbers, bark siding, rustic rails and more.

BlueLinx
Melanie B. Hensley
(828) 231-4738
Fax: (828) 298-7832
4300 Wildwood Parkway
Atlanta, GA 30339
www.bluelinxco.com
mbhensle@bluelinxco.com

Builders FirstSource
Antonio Grion
(828) 252-2686, ext. 328
Fax: (828) 252-7807
332 Haywood Road
Asheville, NC 28806
www.buildersfirstsource.com
antonio.grion@bldr.com

Deltec Homes
Steve Linton
(828) 253-0483
Fax: (828) 232-4328
69 Bingham Road
Asheville, NC 28806
www.deltechomes.com
slinton@deltechomes.com
We have produced energy-efficient, round homes for 40 years. Our homes are panelized in a controlled setting and provide a low-waste, high-performance structure.

GBS Lumber Inc.
Lou Hutchings
(864) 288-3627
Fax: (864) 675-5982
11 Geneva Court
Greenville, SC 29607
www.gbslumber.com
lhutchings@gbslumber.com
GBS Lumber Inc. is a local, employee-owned, full-service lumber yard and millwork specialty center based in Upstate South Carolina. Serving custom builders in N.C., S.C., Ga.

High Country Timberframe & Gallery Woodworking Co.
Tom Owens and Scott Clark
(828) 264-8971
Fax: (828) 264-8787
P.O. Box 1858
Boone, NC 28607
www.highcountrytimberframe.com
tomo@highcountrytimberframe.com and scottc@highcountrytimberframe.com
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Master Concrete Foundations
Rex Lively
(828) 650-9464 / Fax: (828) 650-9469
111 Guaranteed Way
Fletcher, NC 28732
www.mastercompanies.com
rex_lively@mastercompanies.com
From retaining walls to complex foundations, the Master team provides your total, turn-key solution. Poured walls, foundations, pumping, stone slingers, waterproofing.

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Gerald Beal
(828) 342-4739
Fax: (828) 350-1839
20 Battery Park Ave., Suite 814
Asheville, NC 28801
www.smtimber.com
info@smtimber.com
Custom timber-frame home design and construction. Structural Insulated Panel sales, design and installation. Full timber, panel enclosures and hybrids.

Stock Building Supply
Donna Colvin
(828) 681-0574
Fax: (828) 681-0727
101 Continuum Drive
Fletcher, NC 28732
www.stockbuildingsupply.com
donna.colvin@stocksupply.com

sustainable wood products

Appalachian Antique Hardwoods, LLC
(828) 627-0830
Fax: (877) 817-7764
P.O. Box 167
Waynesville, NC 28786
www.aahardwoods.com
info@aahardwoods.com
A national leader in providing 130+ reclaimed wood and natural element certified green building products, including flooring, timbers, bark siding, rustic rails and more.

Asheville Treecyclers
(828) 450-1375
P.O. Box 8175
Asheville, NC 28814
www.treecyclers.org
info@treecyclers.org
Asheville Treecyclers transforms downed urban trees into high-quality wood products and works to further the awareness of sustainable urban forestry in our community.

Carolina Mountain Doors
Kate Fox
(828) 654-9085
Fax: (828) 654-9087
195 Cane Creek Road
Fletcher, NC 28732
carolinamtndoor@bellsouth.net
We specialize in steel and custom wood (reclaimed and new) garage doors. We also sell reclaimed wood flooring materials from the Bluegrass of Kentucky.

Columbia Forest Products
Richard Poindexter
(800) 637-1609
Fax: (336) 605-6969
369 Columbia Carolina Road
Old Fort, NC 28762
www.columbiaforestproducts.com
rpoindexter@cfpwood.com
Manufacturer of hardwood plywood. Members of the USGBC and FSC. Uses PureBond, patented urea-formaldehyde-free resin in manufacturing.

Highland Craftsmen Inc.
Chris McCurry
(828) 765-9010
Fax: (828) 765-9012
534 Oak Ave.
Spruce Pine, NC 28777
www.barkhouse.com
chris@barkhouse.com
Highland Craftsmen Inc. designs, manufactures and sells natural, green Bark House® architectural elements for the whole home, interior and exterior.

Leed Bear Inc.
Michelle Masta
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Fax: (828) 349-3399
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Franklin, NC 28734
www.leedbear.com
michelle@leedbear.com
Our mission is to supply builders and homeowners with reclaimed, recycled and ecologically friendly materials, while educating our clients to their benefits and tax savings.

Sunrise Sawmill Inc.
Don and Michelle Shuford
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Fax: (828) 277-0120
68 West Chapel Road
Asheville, NC 28803
www.sunrisesawmill.com
sunrisesawmill@aol.com

Timberclad Natural Products
Nylenda Heatherly
(828) 648-6092
217 Bethel Drive
Canton, NC 28716
www.poplarbarksiding.com
barkclad@bellsouth.net
Timberclad Poplar Bark Siding offers the highest quality bark siding to clad the interior or exterior of your home. 100 percent customer satisfaction.

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treecyclers@yahoo.com
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wall system installers

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Asheville, NC 28814
energywisejeff@earthlink.net
We are an Insulated Concrete Form (ICF) installation company. We can install a super energy-efficient basement, or do all of the exterior walls of your home or business.

Master Concrete Foundations
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111 Guaranteed Way
Fletcher, NC 28732
www.mastercompanies.com
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From retaining walls to complex foundations, the Master team provides your total, turn-key solution. Poured walls, foundations, pumping, stone slingers, waterproofing.

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www.thesmartbuilder.com
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water conservation & purification

A2Z Plumbing Contractors Inc.
Georg Efird
(828) 236-3880
Fax: (828) 232-6967
Asheville, NC
www.eatsleepplumb.com
a2zasheville@eatsleepplumb.com
Accredited green plumbers providing plumbing and gas piping, residential and commercial. Water audits, greywater and rainwater, high-efficiency hot water circulation and more.

American Water Care Inc. / EcoWater Systems
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3379 Dellwood Road
Waynesville, NC 28786
americanwatercareinc.com
ecowaterwnc@bellsouth.net

Cistern Sister
Kathryn Cartledge
(828) 768-7171
97 June Sayles Road
Asheville, NC 28803
cisternsister@charter.net
Cistern Sister: Sales and complete installation of rain harvest catchment systems for above and below ground. Commercial, residential and new construction.

Sustaining Rain, LLC
Georg Efird
(828) 236-3880
Fax: (828) 232-6967
Asheville, NC
www.sustainingrain.com
jake@sustainingrain.com
Full-service rain harvesting company providing consultation, design, installation, sales and service for residential, commercial or industrial rainwater harvesting needs.

Water Solutions by Icenhower's Farm
Rick Icenhower
(828) 683-3237
Fax: (828) 683-9155
179 Icenhower Road
Leicester, NC 28748
www.icenhowersfarm.com
info@icenhowersfarm.com
Rainwater harvesting, stormwater management, cisterns (above or inground), infiltration systems, low-well solutions, bulk water.

woodworkers and cabinetry

Asheville Kitchen Tops
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Asheville, NC 28806
aktops@nc.net
Countertops and work surfaces made from sustainable/recycled materials. Affordable, custom bamboo cabinets. More than 15 years experience in fabrication and installation.

Bassett Builders Inc.
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Arden, NC 28704
zach@bassettbuildersinc.com

Build It Naturally Inc.
Jennifer Woodruff
(828) 254-2668
Fax: (828) 254-3778
76 Biltmore Ave.
Asheville, 28801 NC
www.builditnaturally.com
info@builditnaturally.com
Recycled, renewable and nontoxic building materials. Offering locally made paints and finishes, flooring, countertops, cabinetry, architectural accents and much more.

Cooper House Fine Cabinetry
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Asheville, NC 28803
www.cooperhousecabinets.com
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Kitchen and bath design, cabinetry, countertops, tile, wine cellars, closets.

High Country Timberframe & Gallery Woodworking Co.
Tom Owens and Scott Clark
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Fax: (828) 264-8787
P.O. Box 1858
Boone, NC 28607
www.highcountrytimberframe.com
tomo@highcountrytimberframe.com and scottc@highcountrytimberframe.com
A leader in custom timber framing, High Country Timberframe & Gallery Woodworking Co. strives to ensure that "the second life of the tree be as dignified as the first."

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1025 Brevard Road, Suite 7
Asheville, NC 28806
www.morespaceplace.com
aballew@morespaceplaceasheville.com

Paul's Custom Woodworking
Paul M. Schmitz
(828) 712-6234
Fax: (828) 669-2006
190 Eastside Drive
Black Mountain, NC 28711
www.paulswoodworking.com
paul@paulswoodworking.com

SAGE Builders of WNC Inc.
Doug Keefer
(828) 713-7208
Fax: (828) 683-1224
299 Morgan Branch Road
Leicester, NC 28748
www.thesagebuilders.com
info@thesagebuilders.com
SAGE (Sustainable, Apprpriate, Green and Efficient) Builders specializes in custom homes with fine woodworking and solar amenities.

Woodworking & Cabinetry (cont'd)

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Gerald Beal
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Fax: (828) 350-1839
20 Battery Park Ave., Suite 814
Asheville, NC 28801
www.smtimber.com
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Custom timber-frame home design and construction. Structural Insulated Panel sales, design and installation. Full timber, panel enclosures and hybrids.

Stillwater Construction Inc.
Chad Vanne
(828) 674-6833
Fax: (828) 697-3395
P.O. Box 928
Hendersonville, NC 28793
www.stillwaterconstructioninc.com
stillwatercc@hotmail.com
Stillwater specializes in the construction and renovation of residential and commercial buildings using both energy- and resource-efficient building practices and systems.

The Grove Cabinet Gallery
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(828) 687-7688
Fax: (828) 687-0942
1785 Brevard Road
Arden, NC 28704
www.thegrovecabinetgallery.com
bill@thegrovecabinetgallery.com

The Western Carolina Home Place Inc.
Steve Wallin
(828) 645-0506
Fax: (828) 645-8816
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www.thewchomeplace.com
steve@thewchomeplace.com
Ten lines of cabinetry, including Showplace, Schrock, MidContinent, Bruce, Lifetime and others. Countertop options, including granite, quartz, concrete and others.

Steve's Puzzlers.

Two classic puzzles with a green building twist. *Author's Note:* As much as I really enjoyed making the crossword, I could not quite get it to be a perfect crossword. So please forgive the imperfect symmetry and the few areas that do not make real words. Any non-words are given in the puzzle to avoid confusion…Enjoy!

ACROSS

2 Window manufacturer
4 Can't live without enough moisture
8 Flashing must do this properly
10 Nasty formaldehyde
12 Measures efficiency of furnace or boiler over a typical year
13 "____ percent for the planet"
14 Window heat loss property is typically
15 Lose the last letter of this soft flooring, then find the matching latin companion.
16 100,000 BTUs
17 Building materials that slow moisture flow
18 Type of ductwork
20 Psychrometric _____
23 Monthly pusblished by BuildingGreen.com
25 Dual flush
26 "Build _____, ventilate right"
28 OSB, foam, and -- hold the mayo
30 Li ____ batteries
31 Thermal shortcut, often through framing lumber in a house
34 The beginning, the starting point. The time to incorporate green into the
37 Developer of standards
40 The energy "bar" is set by this
42 Two wds: If yours is getting old and not so cold, what should you get?
43 Two wds: Is green building mainstream?

DOWN

1 "Super____"
2 Allows the meter to run both ways
3 Heat flows from _____ to colder
4 Right sized HVAC tool
5 Phantom power: wasted energy from things that are never really ____
6 One lumen per square meter
7 Round house maker
8 Super-thin, metallic layer in windows
9 Measure of how easily moisture flows through a material
11 One factor to consider when considering an energy upgrade
18 Programmable thermostats automatically adjust this
19 Building Performance Insitute, jumbled
21 To be effective, what must the insulation and air barrier be?
22 A measure of cooling capacity
24 You won't get your HBH certificate until your HERS rater does this
27 Super efficient windows have how many panes?
28 One of several states mandating LEED on all new large state
29 Deltec would say this is a very green number
32 Balanced ventilation, _____ = outlet
33 An unusual direction, but the way to go to find geothermal
35 The tradable environmental benefits of wind, solar, etc.
36 Almost like foam legos
38 Solar powered coffee in Asheville at the green _____
39 ____ Dams, usually caused by warm air leaking from house to
41 Number of times we have equal day and night each year

For answers, visit www.wncgreenbuilding.com

Resources

• Alternative/Renewable Energy

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)

Build It Solar is the Renewable Energy site for Do-It-Yourselfers. (www.builditsolar.com)

Passive Solar Home Design Checklist (www.greenenergyohio.org/page.cfm?pageID=447)

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

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 about 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)

Habitat for Humanity Home Store sells donated building materials to the general public and offers deconstruction services. Donate anything from building materials, to appliances, to tools, to flooring. (www.ashevillehabitat.org/home_store)

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)

• Remodeling/Renovation

REGREEN offers the USGBC and ASID sustainable renovation practices guidelines. (www.regreenprogram.org)

Earthcraft Renovation provides Southface Energy Institute's green remodeling checklist and rating system. (www.earthcrafthouse.com/About/renovation.htm)

Build It Green has a comprehensive green remodeling checklist. (www.builditgreen.org/greenpointsremodel.xls)

• Indoor Air Quality

U.S. EPA gives information relating to mold, air quality, 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. (http://earth911.org/water/water-conservation/)

Texas A&M Rainwater Harvesting Guide to rainwater harvesting, management and reuse. (http://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 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 context of responsible environmental stewardship. (www.seeexpo.com)

True Nature Country Fair features vendors of local, organic and sustainable products, as well as resources from throughout the Southeast, workshops on all facets of sustainable living, a children's program and live music, all in a pristine mountain setting. (www.organicgrowersschool.org/content/1515)

• Publications

Enviromental 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)

Back Home Magazine is the magazine that delivers useful do-it-yourself information on sustainable, self-reliant living. (www.backhomemagazine.com)

New Life Journal is the Southeast's source for practical information about natural healing, green building and sustainable living. (www.newlifejournal.com)

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)

Enviromental 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.

These are just a few of the green building tools sold in the Habitat Home Store.

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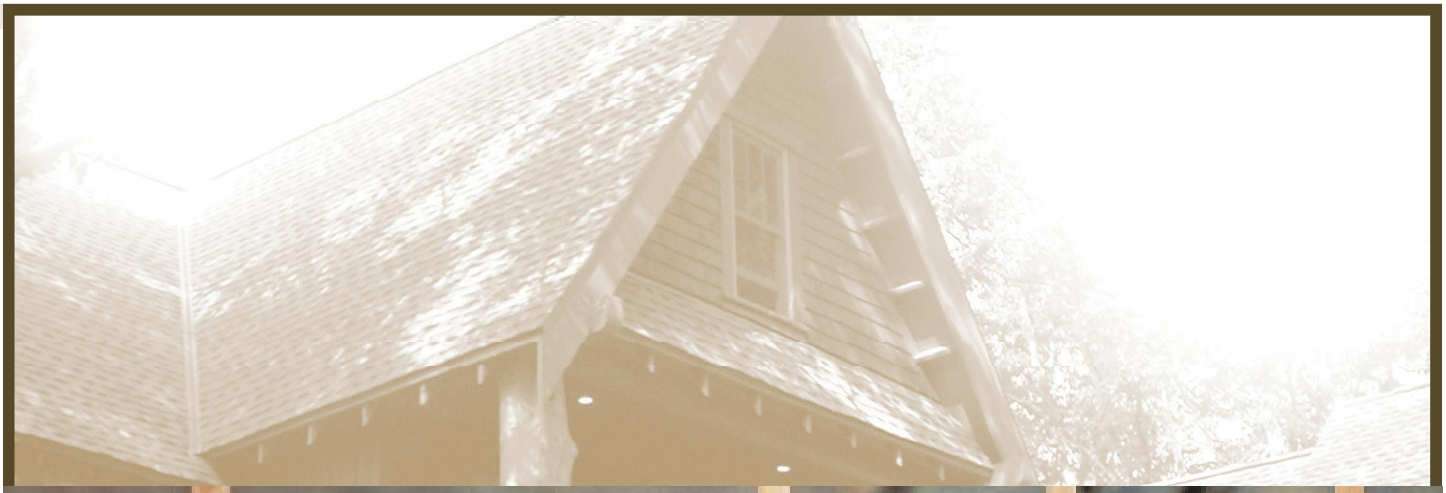

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