

Green Appeal,

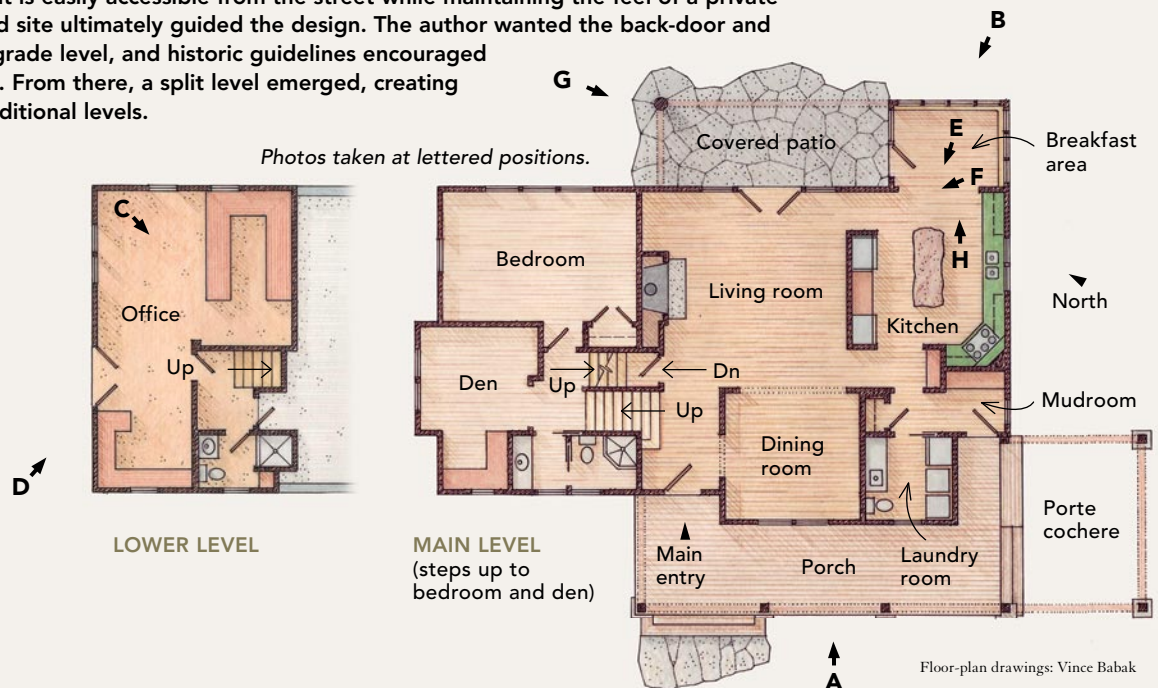


A SPLIT-LEVEL PLAN THAT FLOWS LIKE AN OPEN ONE

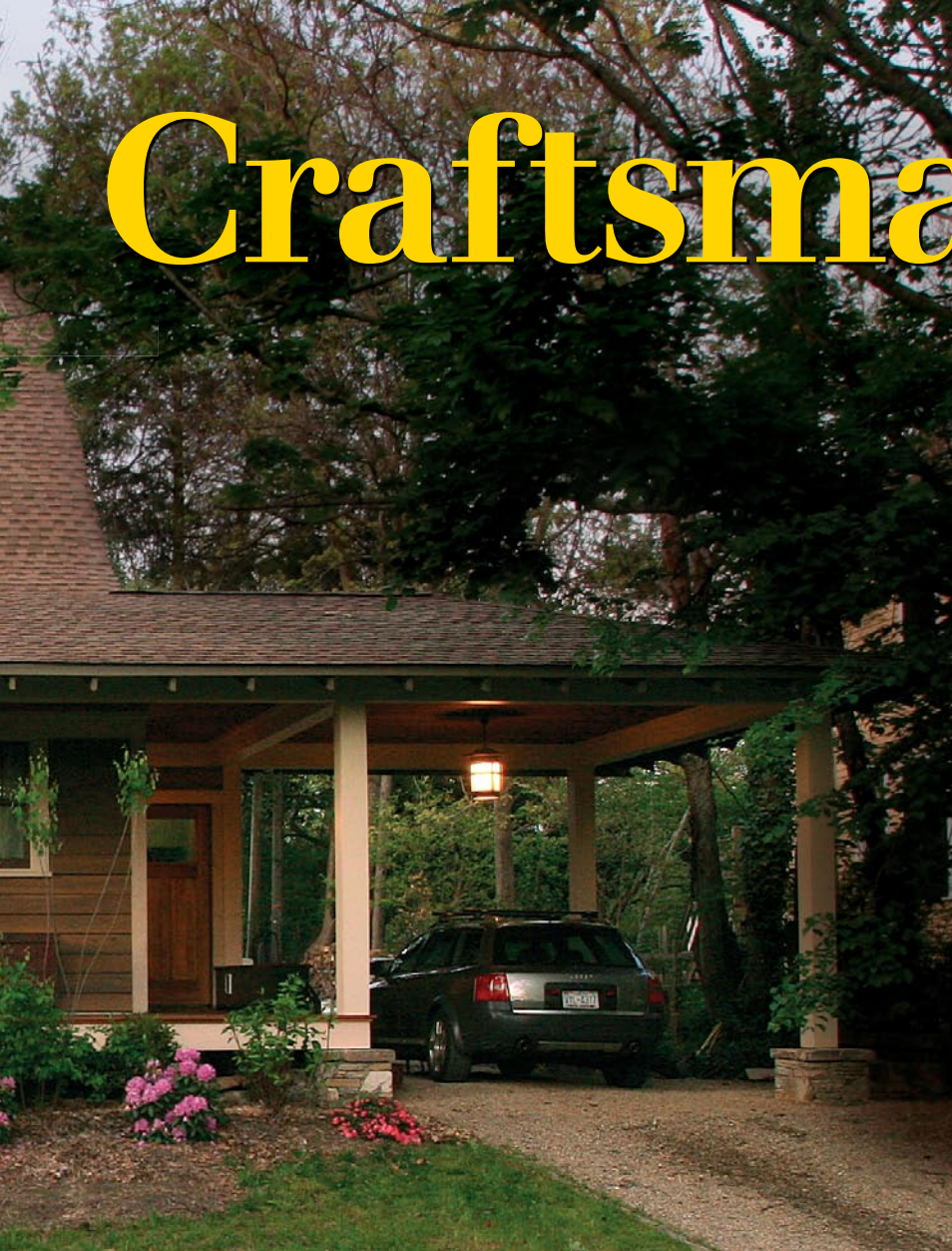
Incorporating a home office that is easily accessible from the street while maintaining the feel of a private residence was tricky. The sloped site ultimately guided the design. The author wanted the back-door and office entrances both to be at grade level, and historic guidelines encouraged a large porch to face the street. From there, a split level emerged, creating an open main floor and four additional levels.

SPECS

- Bedrooms:** 3
- Bathrooms:** 3½
- Size:** 3000 sq. ft., including 500-sq.-ft. office
- Cost:** \$140 per sq. ft.
- Completed:** 2006
- Location:** Asheville, N.C.
- Architect:** Michael McDonough Architect, PA
- General contractor:** Camp Branch Construction



Craftsman Feel



Testing an attainable approach to green practices, an architect designs his own home for a friendly fit in a historic district

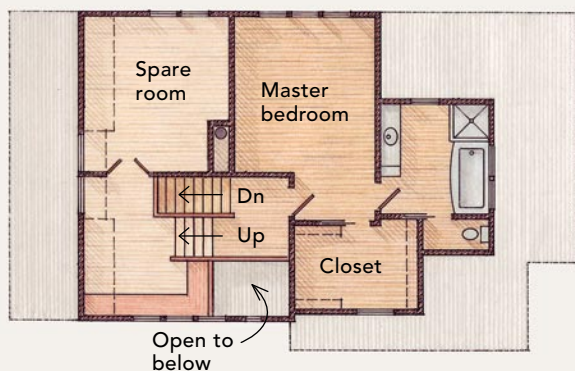
BY MICHAEL McDONOUGH

As an architect and a refugee from the American automobile culture, I jumped at the chance to buy one of the few large lots in Montford, a historic district close to downtown Asheville, N.C. The lot had been vacant since the 1960s, when a fire consumed the large, rambling house that had occupied it. Although the trolley line that allowed neighborhood residents to commute downtown is long gone, the location still accommodates walking, biking, and riding buses and means a short drive to my wife's workplace. It was an ideal place for us to build a house, and the timing was perfect for me to test the beliefs about sustainability I've formed since my days as an architecture student.

Green house, old neighborhood

For simple sustainable-design strategies, we needed only look at neighboring houses constructed of local materi-

Classic style that blends in. It's the details you can't see that set this house apart: an efficient building envelope, a solar hot-water system, and other sustainable-design strategies. Photo taken at A on floor plan.



UPPER LEVEL
(steps up to spare room)

WHAT MAKES IT GREEN?

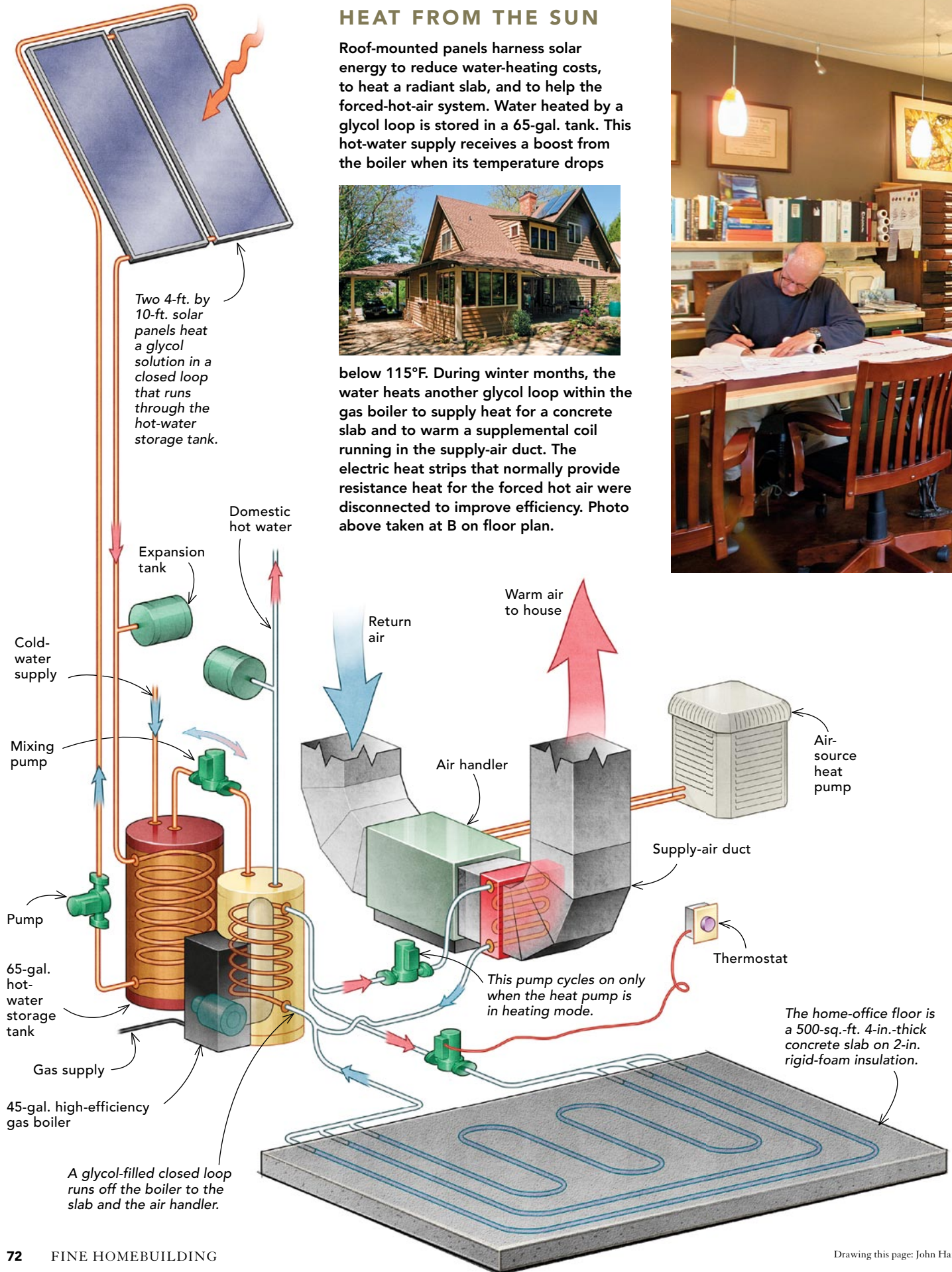
- Broad roof overhangs and porches on the east and west shelter the building, increasing material life and decreasing solar gain. Roof runoff is collected and directed for irrigation.
- Spray foam in the walls and in the roof cavities creates a tight, energy-efficient building envelope. An insulated and sealed crawl-space creates a passive geothermal benefit.
- Renewable materials (lots of wood) produced regionally support local sustainable industries and require less fossil-fuel use in transportation.
- Energy Star appliances, a high-efficiency two-stage heat pump, and a high-efficiency gas boiler contribute to energy savings.
- Aggressive waste separation, recycling, and reuse (for example, unused roof shingles line the garden path) minimized landfill impact.
- Solar panels provide hot water and radiant heating; a high-efficiency wood-burning fireplace with a catalytic converter pressurizes the house with heated air.

HOT WATER AND HEAT FROM THE SUN

Roof-mounted panels harness solar energy to reduce water-heating costs, to heat a radiant slab, and to help the forced-hot-air system. Water heated by a glycol loop is stored in a 65-gal. tank. This hot-water supply receives a boost from the boiler when its temperature drops



below 115°F. During winter months, the water heats another glycol loop within the gas boiler to supply heat for a concrete slab and to warm a supplemental coil running in the supply-air duct. The electric heat strips that normally provide resistance heat for the forced hot air were disconnected to improve efficiency. Photo above taken at B on floor plan.





A short commute. The basement office has its own grade-level entrance. Double doors, brackets, and a sheltering bump-out lend a professional presence. Inside, the radiant-slab floor was finished inexpensively with concrete stain and sealer. Photos taken at C and D on floor plan.

als prior to cars and air-conditioning. In Asheville, many prewar buildings merged the popular English Arts and Crafts style with the vernacular of the southern Appalachians. These homes incorporated the logical responses to our local moist, temperate climate such as broad porches, large windows, and deep roof overhangs to capture afternoon breezes and to provide shelter from the sun.

Many of my clients choose to avoid wood on the house exterior in favor of low-maintenance alternatives like fiber-cement siding, stucco, or masonry. This approach makes sense, but with broad overhangs, porches, and trees to keep direct sun and abundant rain off the siding, I usually favor renewable, locally harvested wood.

All the interior trim is yellow poplar, and so is much of the siding, porch decking, and ceiling paneling. One of my favorite wood species, poplar is the bamboo of the Appalachian forest. It grows straight and fast, with a nice grain suitable for stain. The poplar for our house came from Appalachian Sustainable Development (www.asdevelop.org), a nonprofit co-op about 150 miles from here that practices sustainable forestry. The doors are also made of poplar and were manufactured in nearby southern Kentucky (Cox Interiors; www.coxinterior.com).

Other local-lumber species include American-cherry and black-walnut flooring; cherry, hickory, and oak cabinets; and burly maple, which we found at a local mill and used for the fireplace surround. The front door is quartersawn white oak and was made by a craftsman we met at a local trade show. A cherry tree that had fallen in

my neighbor's yard found new life holding up one corner of our back-porch roof.

Like most residents in our neighborhood, we relegate our cars to the street or under a porte cochere. Omitting a two-car garage freed our lot for a basketball court over the old concrete slab at the rear. Eliminating an attached garage allowed space for more windows and daylight. The budget savings were spent on solar panels and radiant heating.

Historic-design guidelines require that the scale of the house be compatible with the streetscape of 3000-sq.-ft. to 4500-sq.-ft. existing historic homes, so the bulk of our 2500-sq.-ft. house was pushed toward the street. Mixed-use zoning allowed me to incorporate 500 sq. ft. for my office, either in the original carriage house at the rear of the lot or in a portion of the new structure. We settled on the latter as a way to increase the scale of the structure. My five-stairstep commute not only frees more of my day, but it also spares me from the heebie-jeebies I get when stuck in traffic and means one fewer car on the road.

Networked mechanical systems save energy

Historic guidelines restrict solar panels from public view, so we found room for only two panels on our south-facing roof. Our solar hot-water system, which is backed by a 95% efficient gas boiler, stores 110 gal. of domestic hot water and heats my office's slab floor.

I chose the highest-efficiency heat pump on the market (made by Trane; www.trane.com). To boost its heating



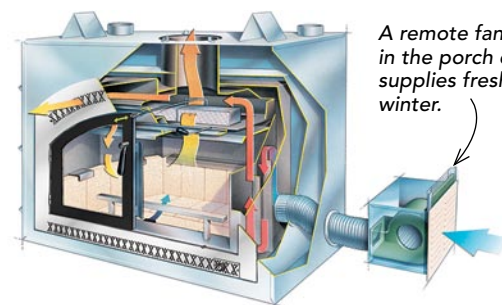
A well-appointed room divider. Deep enough to house wall-mounted ovens, the fridge, and an office nook, a kitchen partition wall stops short of the ceiling, allowing warm air from the living-room fireplace to circulate more freely. Cherry cabinets, black-walnut floors, and a custom-made concrete-topped island add to the kitchen's Craftsman feel. Photos taken at E and F on floor plan.



AN EFFICIENT WOOD-BURNING FIREPLACE

While they're nice to look at, most fireplaces aren't energy efficient. So instead of a standard fireplace, the house has a heat-circulating fireplace insert that burns wood efficiently and helps to reduce heating costs. Made by Fireplace Xtordinaire (www.fireplacex.com), the unit has a remote fan that pulls in outside air to be heated as it circulates around the firebox before being discharged into the room. Heated air

pressurizes the house, minimizing air infiltration. Mature hardwood trees on the property are pruned and dead trees culled for firewood. Because of the open floor plan and the location of the fireplace, a fire kept going during the day heats the house; the heat pump runs when no one is awake to feed the fire. On sunny days, the lower level's radiant slab supplements the fireplace. A cord of wood provides heat for an entire winter.



A remote fan mounted in the porch ceiling supplies fresh air in the winter.

cycle, the solar contractor ran a loop off the solar hot-water system through the supply ductwork in the air handler. For added efficiency, the HVAC contractor disconnected the heat strips, which normally provide inefficient electric-resistance heat when the heat pump can no longer extract latent heat from the air.

Rather than have the heat pump sized by the HVAC contractor, who usually calculates capacity by plan area, we engaged the services of a home-energy specialist (Home Energy Partners; www.homeenergypartners.com) to size a unit that would account for high-performance insulation, doors, and windows, as well as solar orientation, overhangs, and solar-tinted windows. They specified a 3-ton unit, a ton less than typical for a 3000-sq.-ft. structure.

Many of my clients are now choosing geothermal heat pumps, which actively enhance efficiency by capturing the mid-60°F ambient ground temperature through subterranean piping loops. Instead, I chose a less-expensive passive system. Foundation walls are insulated within the crawlspace by rigid foam and Icynene (www.icynene.com), and the earthen crawlspace is covered with a 20-mil moisture barrier taped at the joints. This system insulates the house from seasonal extremes, allowing the crawlspace to act as an internal heat/cold sink.

Experts agree that the building envelope has the biggest impact on a home's energy performance. With that in mind, I set out to construct a building envelope that is incredibly well-insulated but still allows for good air quality. I approached choice and placement of mechanical-system materials and products with the mind-set that everything would function as a complete system.

Icynene foam, which was sprayed in all the wall and roof cavities, combines with high-performance Marvin windows (www.marvin.com) to keep the house tight. Incorporating all the ductwork within the thermal envelope minimizes concerns about leaky ducts or condensation.

Sustainability builds from the ground up

Construction is often a wasteful, inefficient process, so we paid special attention to the Dumpster and the landfill. Soil excavated for footings and the basement was spread elsewhere on the site. All nontreated/nonfinished wood scraps were burned in the fireplace for heat during construction. Gypsum-board scraps fill the area under the porte cochere, metals went to the scrapyards, and curbside recycling took most cardboard, paper, and plastics. Had we found a use for plywood scraps, we might have limited our landfill contribution to one Dumpster load.

Recent local flooding and an impending city storm-water tax encouraged us also to eliminate rainwater runoff. Over time, we might slowly add salvaged brick pavers, but we initially are using a pervious driveway of road-bond gravel and sand base compacted by six months of rain and construction traffic, topped at the end of the project by local pea-size river stone, with a mulch strip down the middle. Combined with in-ground and roof



gutters directed to French drains and rain barrels, all rainwater can percolate on the property.

After living in the house for more than a year, my wife and I are happy with its performance. We are pleased that the wood-burning fireplace (sidebar facing page) essentially provides whole-house heat while creating a cozy ambience. So far, the only thing I would do differently is to incorporate storage for things normally kept in a garage. My wife and I are now designing an ancillary structure that will be part garden shed, part wheelhouse, and part tree fort. We find new things to enjoy about the house every day, and we really enjoy opening our doors to neighbors and friends. □

Michael McDonough is president of Michael McDonough, Architect, PA, and Camp Branch Construction in Asheville, N.C. Photos by Chris Ermides, except where noted.

A fallen cherry tree becomes a post. Local stone laid in an organic pattern spills out from the living room and kitchen to form the patio. Locally harvested cedar and poplar siding protect the exterior. Tall windows and full-lite doors let in ample light. Photos taken at G and H on floor plan.