

By Molly Reid / Staff writer

Architect Steven Bingler knows a thing or two about harmony.

In the front room of his recently completed, 3,400-square-foot home, Bingler approached a dark-brown Steinway grand piano and played two notes in unison, letting the hollow sound of the interval slowly fade away before speaking.

"Isn't that great?" he said, smiling. He wasn't just testing the acoustics. The two notes he played comprised a perfect fourth interval, such as a C and an F, or the first two notes of "Here Comes the Bride." Different musical intervals correspond to mathematical ratios based on the relative frequencies of the two tones, and the 4:3 ratio of the perfect fourth is precisely the dimension Bingler used in designing many of the rooms in his house. So, when he played the fourth on the piano, he was audibly manifesting the geometry of the room.

Sound heady? That's just a tip of the iceberg.

Bingler spent a year before and after Hurricane Katrina designing the three-story Carrollton home. Aesthetically, it's a modern interpretation of the traditional south Louisiana vernacular. Environmentally, it's possibly the most efficient and progressive residential structure New Orleans has ever seen; it's in the process of earning a certification under the Leadership in Environmental Excellence Design residential code, also known as LEED for Homes. Architecturally, it is an experiment in applying the principles of sacred geometry — or the study of certain mathematical forms believed to have universal significance — to residential design.

Bingler simplifies the concept, saying it's all about different kinds of harmony: harmony with the surrounding streetscape, with nature and with the universe.

"I think at the core of it, that's what the green movement is all about," he said. "I wanted this to be a learning experience for myself and for other people so that in New Orleans, we could be in tune with other things that are going on all over the world."

It's cool to be green

What's going on all over the world, at least in the Western industrialized world, is a movement toward more environmentally and socially sustainable building practices, which focus not only on energy-efficiency but also on preserving communities and using local resources.

However, as Bingler points out, Louisiana's traditional architectural style is already green, having been designed around natural cooling and ventilation systems. It was the idea of bringing Louisiana's past up to speed with today's green technology that helped shape his home's design, he said.

"I've always lived in historic houses, and I've always tried to understand how houses were built with no air conditioning or heating, except for fireplaces. In our climate, if you can keep the air in motion, you can keep the house cool, most days, naturally," Bingler said, calling the idea the "harmony of comfort."

The house has a wraparound porch with a 10-foot awning, as well as walls composed of

Continued on Page 28

HARMONIC CONVERGENCE

Sacred geometry unites with green building in architect's unique vision

The dimensions of the western facade constitute a 'golden rectangle,' based on the ratio called phi. This golden ratio also appears in the architecture of the ancient Greeks, Renaissance paintings and in Stonehenge. 'Geometry played a very important role in the design of this house,' Bingler said.

At first glimpse, the floor plan might seem typical, but add the dimensions of the rooms, which correspond to the mathematical ratios of perfect musical intervals, and it gets a lot headier.

VENTILATION FEATURES

More than 60 clerestory windows help air flow in and out of the house. Each has a programmable motor, allowing the house to close itself up when it gets too hot outside.



▲ An open staircase sucks warm air up to the third floor, where it is blown out a lowered window in the attic by a 4-foot-wide fan.

French doors comprise much of the western wall, allowing for more air flow.

WATER RETENTION & PERMACULTURE



◀ A 1,200-gallon wooden cistern, lined with fiberglass, sits on the side porch to collect rainwater, which is used to flush toilets, wash cars and water plants.

STAFF PHOTOS BY MICHAEL DeMOCKER



◀ A pair of drainage spouts channel rainwater through a perforated pipe system beneath gravel beds in the front, side and back yards.



◀ The backyard's urban forest contains citrus, avocado and pomegranate (LEFT) trees, as well as blackberry and blueberry bushes and an herb garden. A small patch of muscadine grapes is growing on the fence, and a ring of banana trees outlines the composting pile in the corner. It's already a hit with monarch butterflies, which Bingler says have been appearing daily.

The front yard's marsh permaculture habitat uses such native species as swamp cypress, swamp lily, azalea and ferns to help suck up rainwater. The side yard's upland habitat features a dogwood tree, fireplant, pussywiltows, horsefalls and aster.

ROOF AND AWNINGS



◀ The roof is pitched at 30 degrees so sunlight can penetrate its solar panels at a perpendicular angle, thus maximizing the amount of energy generated. Says Bingler: 'Even though it looks arbitrary, it's not arbitrary. Virtually everything in this house is here for a reason.'



A row of thermal collectors at the bottom of the roof provides hot water for the entire house. Water running through snaf pipes in the collectors is heated by the sun and sent to an insulated tank in the attic.

Twenty-four photovoltaic cells collect energy from the sun, generating an average of 4,500 kilowatts every hour. Bingler expects to be one of Entergy's first New Orleans customers to use less energy than he creates.

Dormer windows add a modernized Victorian touch to the third story.

A shallow awning above the second story, called an 'eyebrow awning' or 'light shelf,' reflects sunlight away from the clerestory windows above it and fills the house with natural sunlight, minus the heat. This process is also called daylighting.

GEOTHERMAL

Geothermal wells run water through cooled underground pipes, drawing coldness from the Earth's stable 60-degree temperature. The water is sent to a water-source heat pump, which then cools the air inside the house. Air-source heat pumps, used in most homes, run exterior air over coils filled with refrigerant to achieve cooling. In the summer, starting with 90- to 100-degree air is a much more energy-consuming task than starting with 60- to 65-degree ground-source water.

The roof and awnings are covered in Galvalume, a steel-aluminum hybrid. 'That roof constantly reflects a lot of heat, which is really important in our climate,' Bingler said.

The 10-foot-deep wrap-around porch helps shade the western facade and draws from the south Louisiana architectural vernacular.

STAFF GRAPHIC BY RYAN SMITH

MATERIALS

Floors (RIGHT) are made from bamboo, an easily renewable resource, and are studded with recycled pine beams from a demolished Canal Street building. Formaldehyde-free maple cabinets and countertops composed of a concrete-recycled paper blend are the stars of the kitchen.

► The walls are made of locally produced ash-based concrete, a material made of recycled ash from steel production rather than from quarried limestone. It's more environmentally correct. It's not depleting the Earth's resources," Bingler said. The 6-inch-thick walls are filled with celluloid insulation.

► Wall siding and trim are made from Hardiplank, a fiber cement product that is more wind- and heat-resistant than wood.



Continued from Page 26

most entirely of double-paned clerestory windows and glass doors. The modern twists come from the walls' surface material of recycled ash-based concrete and hardiplank siding and from the curve of the porch's awning, which is topped with Galvalume, a steel-aluminum hybrid, to reflect sunlight.

Like many New Orleans homes, the porch is studded with thick columns, but Bingler's are left unadorned and untextured to match the sleekness of the walls. Borrowing from the Queen Anne style, the third story is studded with three dormer windows, stripped of the decorative trim that usually accompanies Victorian homes.

Below the dormer, a shallow awning lines the bottom of the clerestory windows between the second and third stories. Also topped with aluminum, this higher awning extends less than 2 feet and is called a "light shelf" or "eyebrow awning." While the first-floor awning serves the dual purpose of reflecting light and shading the porch below, the light shelf's main role is to reflect sunlight away from the windows, allowing indirect natural light to enter the house while sparing it the heat — a process called "daylighting."

Daylighting is a keystone of Bingler's modern cross-ventilation plan. While air-conditioning units are a necessity of modern Southern life, Bingler is adamant about maximizing architectural temperature control, which he also calls passive heating and cooling. The house has eight glass French doors on the first floor and more than 60 clerestory windows total. Each window contains a programmable motor so that the house can automatically open or close itself up based on the outside temperature.

"They can provide ventilation and safety at the same time, because they're so high up and small (that) people can't get in," Bingler pointed out. "So you can have them open all night."

To help flush warm air out of the house, a central staircase sucks air directly up to the third floor, where a 4-foot-diameter fan waits to blow it out of a louvered window atop the roof. To help further bolster Bingler's quest for maximum ventilation, the home's floor plan is sprinkled with open patches, such as several open squares at the tops of the walls and gaps between the stairs.

And, to make sure the house only lets in air when it's wanted, the building envelope is virtually airtight, with 6-inch-thick walls filled with celluloid insulation. A



STAFF PHOTO BY MICHAEL DeMOCKER

Architect Steven Bingler, wife Linda Usdin, daughters Anya and Josephine and Ruby the dog in their new Carrollton-area home.

radiant barrier wrap, made of reflective material such as aluminum, radiates heat and cold away from the home, giving it a Thermos-like effect. Fifty tubes of caulk were used to seal all the windows and double-insulated doors.

"(Passive cooling) is about how the house lives and breathes on a beautiful day when you don't need to be doing anything," the architect said. "This house was designed first and foremost to heat and cool itself."

Wells and cells

When the house needs help, however, Bingler doesn't just have a regular air-conditioning unit waiting in wings. In cooling, as well as in supplying hot water and electricity, Bingler has brought out the big guns of green technology.

The house relies on geothermal wells that coil up and down a 300-foot-deep subterranean track. Water in the coiled pipes is cooled by the earth's stable, 60-degree temperature, and is sent to a water-source heat pump, which then uses the cold water to cool the air inside.

"If you start with water that's 65 degrees, as opposed to 90, you only have to change it five degrees" to achieve a typical summertime thermostat setting, Bingler said.

The home's electricity is powered by 24 photovoltaic cells mounted on the roof. It's pitched to a steep 30-degree angle, making it almost precisely perpendi-

cular to the sun at its highest position. The result may give the roof an awkward shape, but it allows for the strongest penetration of sunlight into the solar panels.

And, as Bingler points out, with the City Council's recent adoption of a net metering program, the house can gain energy credits with Entergy from any surplus power collected throughout the day. Because of the geothermal heating and cooling and EnergyStar-rated kitchen and laundry appliances, the amount of electricity needed to power the house is significantly lower than in a traditional home.

"Right now, I'm producing more electricity than the house is using," Bingler said with a proud grin. "In the daytime I can sell that energy back to Entergy, and in the nighttime, I can buy it back."

Also on the roof are four thermal collectors, which resemble photovoltaic cells. Inside the collectors are small pipes with water running through them. The sun heats the water as it passes through the collectors, and the hot water is sent to an insulated tank in the attic to be used for showers, washing dishes and doing laundry.

Water heated by the thermal collectors belongs to one of the home's two plumbing systems, one of which is potable, the other not. For use in tasks such as flushing toilets, watering the yard and washing cars, a 1,200-gallon wooden cistern on the side

porch collects rainwater.

"There's so much rainwater in New Orleans, it's been full since I put it in," Bingler said.

Not content to let the extra rainwater flow idly into the city's clogged drainage system, Bingler had two pairs of drainage spouts installed on the western and eastern sides of the house. The pipes channel rainwater into a subsurface watering system that extends into the front, side and back yards.

"When it rains, I'm containing all the rainwater on my property," Bingler said. "It's not contributing to the flooding of the street. It's feeding my plants and being used."

As for those plants, Bingler hired landscape architect Charles Reith to design permaculture habitats for the front, side and back yards. Each section hosts a different "guild" of native species: swamp lilies, azaleas and swamp cypress populate the marsh habitat, while dogwood, pussywillows and horse-tails compose the upland guild. In the backyard, an urban forest features a cornucopia of fruit trees and berry plants. The newly planted specimens will take several years to mature, but Bingler said he and his wife, Linda Usdin, look forward to developing their edible garden.

Hooked on a phi-ling

Bingler understands that sustainability means more than fancy technology and recycled materials. He blended principles

and accents of traditional New Orleans architecture into the modern design so the house would fit comfortably within the surrounding streetscape, rather than standing out inappropriately. He also employed a grid system for the floor plan and stock dimensions for doors and windows, thereby reducing the amount of material waste accumulated in the construction process.

Due to the lack of locally produced products, Bingler had to compromise economic sustainability by ordering more than 80 percent of the building materials from out of state. However, the landscape plants are local, and the pine lumber used in the interior came from a demolished Canal Street building. Though most of the green products were obtained from businesses in California, Oregon and the Midwest, the construction team hailed from Mississippi and Louisiana.

But beyond sustainability in construction and materials, the spiritual core of Bingler's design lies in a sort of sustainable geometry. With its grid layout, he was able to fit individual rooms, floor plans and façades into specific dimensions that hold a musical and universal resonance. Also known as sacred geometry, this study of finding the divine in mathematics and nature harks back to the world's first civilizations. In the Renaissance, artists and architects suffused their works with visual manifestations of the golden ratio, a mathematical constant also known as "phi."

Bingler designed the western façade of the home to be a golden rectangle, in which the ratio of the long to short sides equals phi. Other rooms were given dimensions that correspond to perfect musical intervals such as the fourth, fifth and octave. The central staircase, a crucial component of the home's ventilation plan, is situated between two concentric circles on the geometric site plan.

Bingler's home may be New Orleans' first residential example of just what it means to be all green, but Bingler says the concept was not to build the be-all, end-all green home — though he does hope to earn New Orleans' first LEED for Homes platinum rating. Instead, he calls the home an experiment in Southern sustainability, bringing together dozens of small- and medium-scale measures, any number of which other homeowners can extract and use in their own homes.

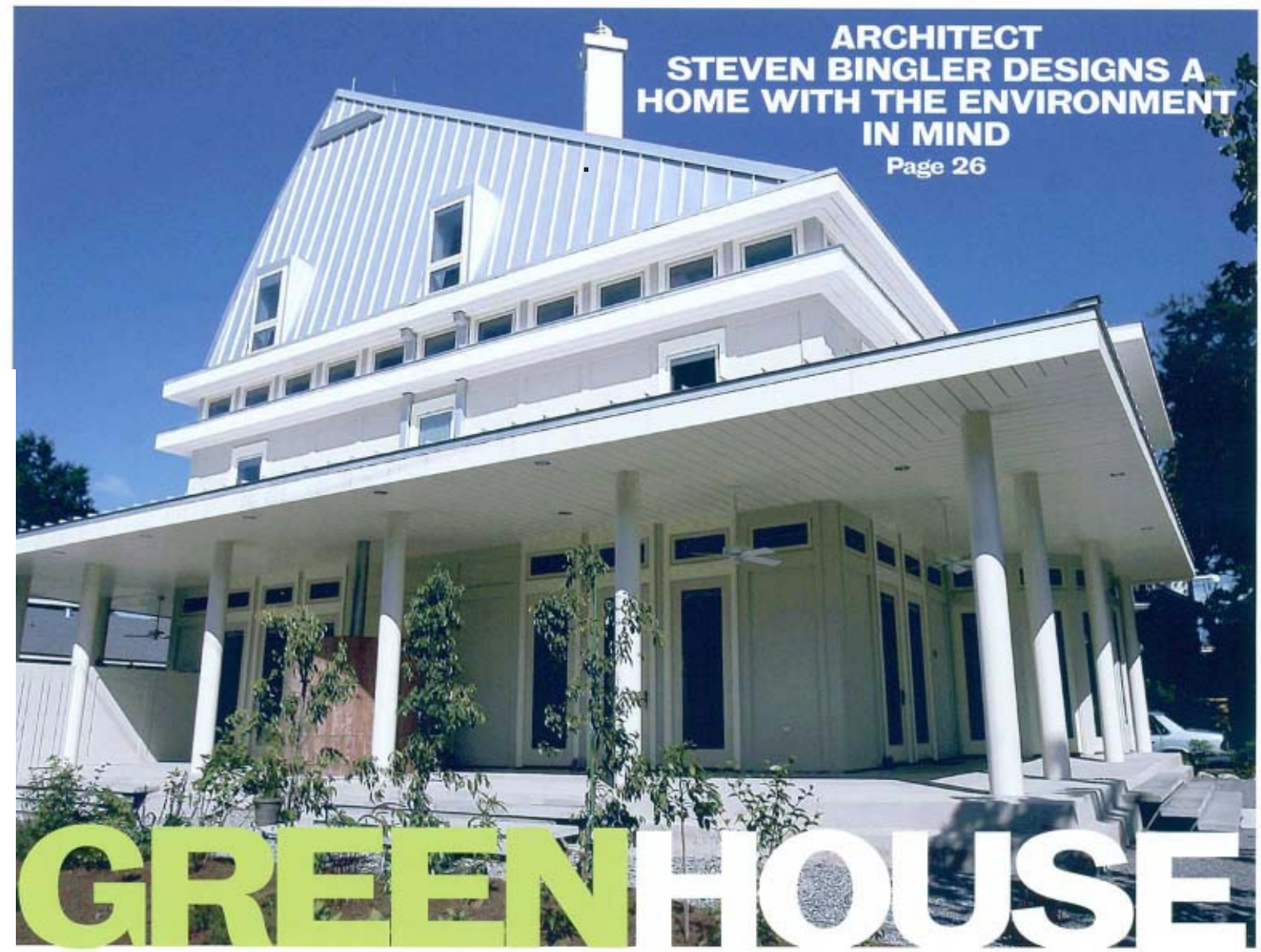
"I wanted to do lots of different things — a lot of small things that would add up to a big thing."

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inside out
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LOCAL HOME SALE PRICES
PAGE 31
REAL ESTATE CLASSIFIED
PAGE 33



ARCHITECT STEVEN BINGLER DESIGNS A HOME WITH THE ENVIRONMENT IN MIND
Page 26

GREENHOUSE

BEDROOM WITH A WILD SIDE
Personal Space
PAGE 10

ORCHID OVERVIEW
Green Thumb
PAGE 29

DEMOLITION MAN
This Mold House
PAGE 50