



Taking the lead

When it comes to energy efficiency and smart growth, Vermonters are taking the lead in a new era of building. **Page 3D**



Oh, sweet potato

The sweet potato's earthy flavors work deliciously with fresh, crisp and spicy Asian characteristics.

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GREEN MOUNTAIN

The Vermont way of life • Assistant Editor Adam Silverman, 660-1854 • www.burlingtonfreepress.com/greenmountain

FEBRUARY 7,
2010
Section D



EMILY McMANAMY, Free Press

ABOVE: The use of glass panels allows natural light into the new Given Courtyard, a free-standing office structure built within the Given Building courtyard at the University of Vermont's College of Medicine. BELOW: The Heritage Aviation building in South Burlington. Beds of sedum plants flank a solar photovoltaic array on the roof of Heritage Aviation's new hanger facility at Burlington International Airport.

Vermonters shape space, **BETTER AND BETTER**

Through new, efficient, green — and yes, aesthetically pleasing — designs, Vermont's building landscape is undergoing a transformation. There are enhancements you can see, and those you can't. And there's something to learn for everyone, from the person on the street to the most involved architect.

IT'S BEEN SAID BEFORE: VERMONT HAS A SHORTAGE OF SUNLIGHT AND A SURPLUS OF COLD.



Joel Banner Baird

Contact Joel Banner Baird at 660-1843 or joelbaird@bfp.burlingtonfreepress.com, and on Twitter at [@vtgoingup](https://twitter.com/vtgoingup).

And its inhabitants live in a world progressively less generous with stacks of cordwood, tankers of oil and cheap airfares to the tropics.

Vermont's architects, bless 'em, are stepping up to the challenge.

Displays of some of their latest (and greatest, some would argue) work will surface Wednesday and Thursday at the Better Buildings by Design conference at the Sheraton Burlington Hotel and Conference Center in South Burlington.

Paul Duane, the planning and development manager for Efficiency Vermont, previewed submissions for the "Best of the Best" awards from churches, colleges, clubs and Moe's Southwest Grill in Williston.

"We have here a collective excellence," he said last week. "They might not all be in the limelight next week, but they all add up. We're all pushing to learn."

What makes a building better? For the purposes of its awards, Efficiency Vermont (the conference organizer) suggests that such a structure will afford its occupants ample warmth and light — and consume as little energy as possible to achieve those goals.

The formula sounds simple. The buildings aren't. They serve a multitude of purposes; they testify to our climate and

our resources — and to conditions our descendants will encounter.

Some of them are downright beautiful as well as practical.

Take, for example, the Given Courtyard.

Message in a bottle

On the University of Vermont medical campus, where open space for construction is at a premium, this baby's a building within a building.

It's a huge, four-story, 31,000-square-foot space-saver. It's alive with light, fresh air and conversation.

The \$12.5 million courtyard building rises, seemingly weightless, from the innards of an otherwise ordinary block building to within 50 feet of a clear, domed roof. The result: a structure that attracts people.

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GLENN RUSSELL, Free Press

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COVER STORY



EMILY McMANAMY, Free Press

Blending old with new, the existing Given Building labs and offices overlook the new Given Courtyard, a free-standing office structure built within the Given Building.

BUILDING: Efficient designs take off

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John Evans, the former dean of medicine and now senior adviser to the president of the university, stood last week on a glass-clad balcony and surveyed the easy flow of doctors, clinicians, students and staff.

"It's become a center, a gathering place," he said. "From the earliest discussions, the question became, 'How do you get people talking?'"

Cafe tables help. So does souped-up acoustical design: Visitors hear a pleasant, conversational murmur — but not an ounce of echo.

Architect Keith Robinson of Montpelier-based Black River Design credits the project's success to close collaboration with his clients.

"We found out that interior hallways in the older building made it hard for people to determine where they were," he said. "People are a lot happier when they see sunlight."

"We created spaces that are self-explanatory," he continued. "There's less need for signage. Sunlight penetrates deep into the new spaces. This is not your usual Vermont building."

The added light reduces the need for artificial lighting.

Other design benefits are less obvious, such as reduced costs of bringing utilities to the site, efficient air-handling equipment, and a system of removable walls and raised floors that ease reconfiguration of space for future needs.

Evans, who terms the structure "a ship in a bottle," said he thoroughly enjoyed the planning process.

"It's sort of been fun," he said. "We've become amateur architects and engineers."

Taking off

Christopher Hill, president of Heritage Aviation, likewise brought his playful, back-of-the-envelope drawings to the table when he decided to restore a 1950s-era hanger at Burlington International Airport.

As per his specs, a bicycle-friendly path leads to Heritage from Williston Road.

A living, "green" roof planted with sedum (in patterns designed to appeal to airborne viewers) drains to a 35,000-gallon underground tank — and the water is used to wash aircraft.

Aviators might not know to thank a bank of solar hot-water panels for the warm showers.



JOEL BANNER BAIRD, Free Press

Sedum plants thrive despite snow on the roof of Heritage Aviation's new hangar facility at Burlington International Airport. The plants slow and absorb stormwater runoff from the building. Solar panels (in the background) help offset energy use inside.

Motorists will be forgiven if they don't notice the pebbly, porous concrete parking lot (another stormwater-reduction measure) or the state-of-the-art LED outdoor lights.

But they can't miss the facility's 100-kilowatt wind turbine, or the south-facing solar panels.

Hill is "a rare owner," said architect Richard Dean of Burlington-based TruexCullins.

An early decision: Strip the building

("a rusting hulk," Dean called it) down to its concrete-and-steel skeleton to preserve structural elements.

"One of the greenest things you can do is not build a new building," he said.

The old Air National Guard hangar's industrial past remains intentionally vivid. Many of the original trusses and beams are now visible. Interior support rods connect to propeller-like hubs. A dull shine emanates from metal interior and exterior walls — a nod to airplanes

alloy skins, Dean said.

The aesthetics embrace energy savings, he added.

Higher ceilings and skylights raise work-light levels. Jumbo-quantities of insulation and sealing result in a high-performance, energy-efficient building "envelope."

When the wind turbine went up last year, Hill said, his vision for a more earth-friendly building stemmed in part from his work with aircraft — "an energy-intensive business" that increasingly commissions designs based on fuel savings.

Many other architectural clients have reached the same conclusion, Dean said: "It's where we're all headed."

Books and pocketbooks

It's where a school in Putney, solidly rooted in farming traditions, plans to take the 21st century

A "net-zero" building, explained Waitsfield architect Bill Maclay, is one that, over the course of a year, generates as much energy as it consumes. The Putney School's new 16,800-square-foot field house is Vermont's first commercial building to hold that distinction.

Completed last year for \$6 million, the project was an exercise in collaboration and forward-thinking, Maclay said. Regular design meetings (termed "charettes" in planning circles) with students, faculty and staff were "incredibly rewarding and a ton of fun" and yielded "extraordinary results," he continued.

Students seized upon the idea of a field house placed beside the dining hall, where it would attract unstructured socializing and pick-up basketball games — along with hardcore workouts.

There was broad agreement that an energy-efficient building would serve the school's emphasis on hands-on learning.

"From the beginning, it was envisioned as a teaching tool," said Don Cuerdon, Putney School's communications director. "This is, among many other things, a working farm: We got on the bus before it was fashionable."

The new building's performance (and the output of its nearby photovoltaic trackers) will expand the curriculum in science, technology and economics, Cuerdon continued.

"We built this place to teach other people how to build this kind of build-

Continued next page

What makes a building better?

Conversations with some of the state's top architects yielded some guiding principles for energy-efficient designs:

SITE

"Aim" new buildings to benefit from solar heat and natural lighting.

CONSERVE

Preventing heat loss (through sealing a structure's "envelope" and insulating) is a critical first step.

FLOW I

A tight building needs a system to introduce fresh air from outdoors.

FLOW II

Slow ("treat") stormwater runoff to minimize impact to watershed.

POWER DOWN

Install energy-efficient appliances.

POWER UP

With renewable energy — but only after considering the above choices. A "renewable-ready" building is one that has been designed (or retrofitted) to require less energy.

COVER STORY



Photo courtesy Putney School

Cows graze outside the new Putney School fieldhouse. The building is a "net-zero" structure: Over the course of a year, it generates as much or more energy than it consumes.

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ing," he said. Maclay's meetings with alumni and the school's board began with price limits and fundraising strategies. Those limits and strategies shifted.

"Throughout those discussions, we showed what various enhancements would offer, both in terms of up-front cost, appearance and capital and operating costs 30 years out," Maclay said.

The choices: to build to code; to build a "micro-load" (or renewable-ready) structure that would require minimal energy input; or the deluxe, net-zero model.

Randy Smith, the school's chief financial officer, ultimately determined it would probably be easier to raise \$1 million for a net-zero building than another \$1 million endowment for future oil bills, Maclay said.

"It's a different world now," he continued. "Efficiency is something we're going to be facing for the next 100 years."

Payback time

Putney School's decision confirms an emerging shift in how a building owner might determine "payback" for efficiency upgrades, energy experts at Efficiency Vermont say.

"Typically, it's meant how quickly you recover your initial investment," Efficiency Vermont's Paul Duane said. "You ask yourself, 'When do I get my dollars back for putting in those solar panels?'"

"You can also measure it as a cash-flow return over the life of the investment," he continued. "Efficiency Vermont is tasked with generating savings. We're saying, 'If you can, this is the way to do things.'"

The new financing model, he added, assumes that fuel prices will, at best, remain unstable for the foreseeable future — and almost certainly will rise.

Blair Hamilton, policy director at Vermont Energy Investment Corp. (the nonprofit that operates Efficiency Vermont) said the model is gaining currency worldwide.

"How much risk do you want to take in assuming that energy prices will remain flat?" he asked. "How exposed do you want to be? Will you wish that you'd



JOEL BANNER BAIRD, Free Press

Steve Smith of Smith Alvarez Sienkiewicz Architects on Thursday discusses energy-efficiency features of a LEED-Platinum building he designed for Middlebury College, shown in a model in his Burlington office.

"I TELL MY SON, 'THIS IS A GREAT TIME TO BE AN ARCHITECT. IT'S BECOME A PROFESSION TRANSFORMED.'"

STEVE SMITH, Smith Alvarez Sienkiewicz Architects

done something different?"
Credentials, color, curves

Other aspects of efficient building design can be quantified more firmly. Many of them are linked to the widely touted certification offered by Leadership in Energy and Environmental Design (LEED), a rating system devised by the U.S. Green Building Council.

In increasing levels of achievement, buildings merit silver, gold and platinum LEED credentials — and their efficiency enhancements range from the installation of bike racks to recycling waste concrete.

Steve Smith, a founding partner of Burlington-based Smith Alvarez Sien-

kiewicz Architects, helped design the state's first LEED-certified building (the ECHO science center on Burlington's waterfront) and its first LEED-Platinum building (on the Middlebury College campus).

He acknowledged the credentials are no guarantee of a successful building. "It's a useful guide; it's not perfect," he said.

Another work-in-progress, he added: measuring a new, energy-efficient-building's beauty.

Smith graciously accepted praise for his firm's award-winning projects this year: renovations of Aiken Hall at Champlain College, and the rustic (and LEED-Platinum-certified) structure at

Gawk, learn, absorb

Vermont's leading architects and builders strut their stuff at the "Better Buildings by Design" conference this week, organized by Efficiency Vermont. The event features displays of new projects and products, and workshops geared to the interests of professionals and homeowners alike.

WHEN: 7 a.m. to 7 p.m. Wednesday; 7:30 a.m. to 5 p.m. Thursday.

WHERE: Sheraton Burlington Hotel and Conference Center; Williston Road, South Burlington.

COST: For both days, advance registration is \$275 (\$300 at the door); single-day advance is \$175 (\$200 at the door). Over the phone: (877) 248-9900.

MORE INFO: Contact Efficiency Vermont at 860-4095.

ONLINE: <http://bit.ly/BetterBuildings>

the Marsh Billings Rockefeller National Historic Park in Woodstock.

Neither Smith nor his project partner, Tricia Roy, found the glittery surface of photovoltaic panels inherently attractive. They become more "acceptable," Smith said, when they are integrated into an existing roofline.

Smith paused. Shelburne Farms, he said, has considered installing an out-of-the-way solar "orchard," comprised of stem-mounted tracking panels.

"That," he said, "would be beautiful." Smith said his evolving notions of architectural beauty face regular challenges with each successive Solar Decathlon, sponsored every year by the U.S. Department of Energy.

Within a narrowly defined budget, decathlon teams from around the world vie for the honor of building the most efficient and aesthetically pleasing structure.

This year, Smith will field a team from Middlebury College, where he teaches. It's a good investment of his time, he said.

"I tell my son, 'This is a great time to be an architect,'" he continued. "It's become a profession transformed."

Speaker seeks to sell consumers on 'practical environmentalism'

By Joel Banner Baird
 Free Press Staff Writer

Suzanne Shelton won't try to convert her Wednesday-morning audience to a cause during her keynote speech.

The crowd of progressive architects, builders and renewable-energy advocates at Efficiency Vermont's Better Buildings by Design conferences already wears its commitment on a collective, rolled-up sleeve.

Shelton, the CEO of a Knoxville marketing and research firm, said she plans to focus on what could be less-familiar territory: the qualms, concerns and cautions voiced by fence-sitting consumers.

"Most of the people making decisions on investing in

their homes are not wondering how they're going to save the planet," she said last week. "They're tuned to comfort and convenience and beauty. And they're considering the money they're going to spend on it."

Privately, she added, her approach to an eco-friendly lifestyle has become "more passionate" — but her work requires her to study, in ever-more objective detail, prevailing views of the shopping public.

Five years ago, 80 percent of consumers she polled could not name a single source of renewable energy.

The most recent poll saw that number drop to 43 percent.

She finds the rising awareness in global energy con-

cerns is reassuring.

But, she said, the uptick typically results in consumer activism of the "low-hanging fruit" variety, such as upgrading to compact fluorescent light bulbs.

Investments of \$1,000 to \$15,000 in home energy efficiency is "the next big nut to crack," she continued.

"It's not always easy to see the results of the more difficult, high-dollar stuff," she said. "A lot of that has to do with financing and access to capital. It's a giant challenge."

Shelton said the challenge is big enough to keep her firm busy for decades.

"We don't consider ourselves tree-huggers," she concluded. "We're not deep-greens. We're practical environmentalists."



Courtesy photo

Suzanne Shelton, CEO of a Knoxville marketing and research firm, will be the keynote speaker at the "Better Buildings by Design" conference.

I BELIEVE

'WE ARE ON THE CUSP OF A NEW ERA IN BUILDING, AND HERE IN VERMONT WE ARE LEADING THE WAY'

The idea of the self-perpetuating machine, an engine that can produce more energy than it uses, is as old as the wheel. From Galileo to "Star Trek," we humans have dreamed and written of it. As architects, we are reminded of this idea when we see the houses that we are now capable of building: houses that can create their own clean

energy — all that they need — light-filled homes that are comfortable, beautiful and healthy places to live.

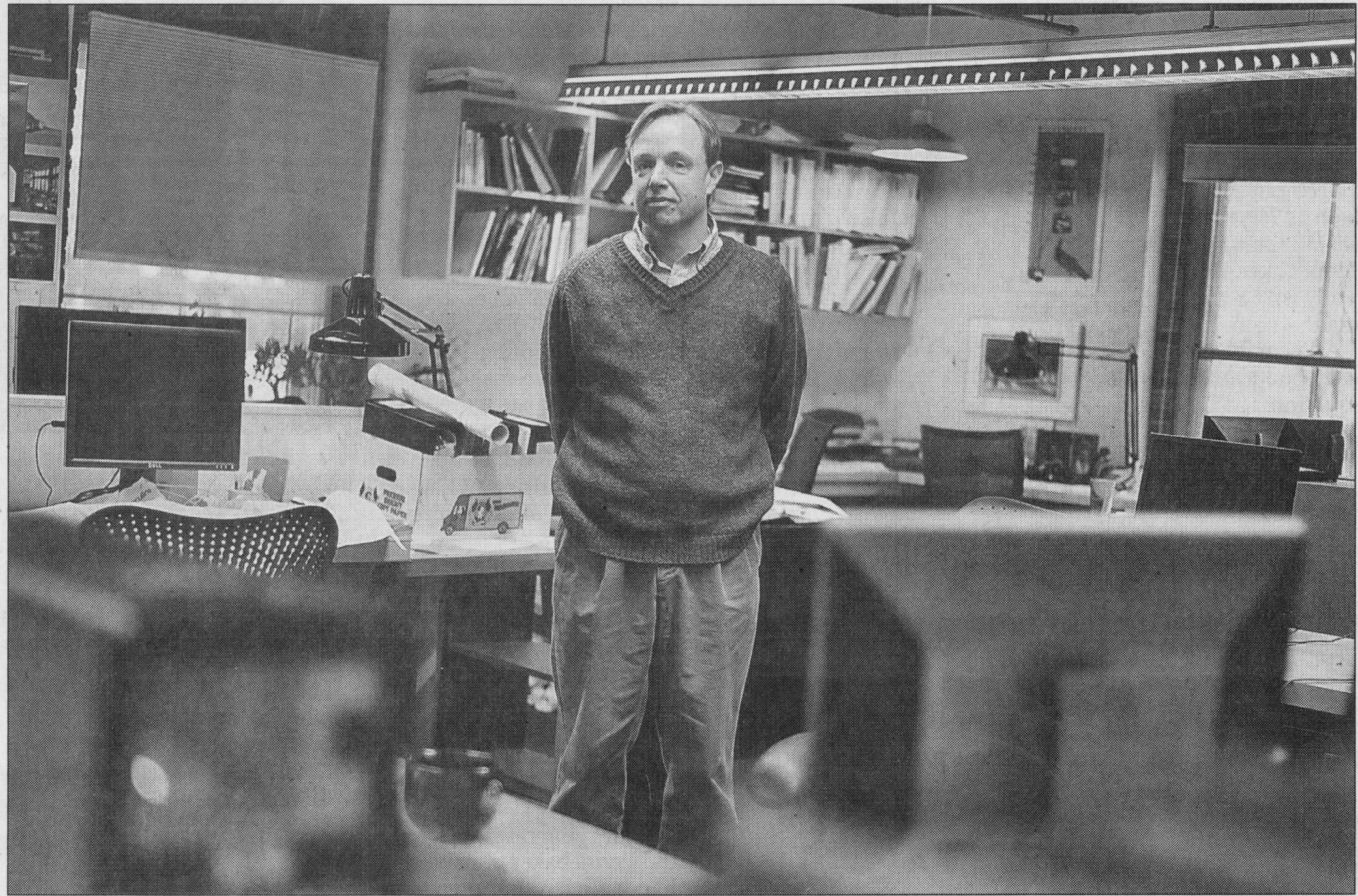
Existing technologies and common-sense building practices allow us to build super-insulated

By Lee Grutchfield

Contact Lee Grutchfield at lgrutchfield@truexcullins.com.

walls and roofs, and to create renewable energy on site — and these capabilities are being used and improved upon daily. We believe that we are on the cusp of a new era of building, and here in Vermont we are leading the way.

One example of this is the South Farm development in Hinesburg, a neighborhood of six homes designed to create most of, and in some cases all of the energy they need. We would like to share with you some of the basic ideas, technologies and design practices used at South Farm, so that you, too, may share in this new era of building.



GLENN RUSSELL, Free Press

Lee Grutchfield of Marshfield is an architect at TruexCullins Architecture and Interior Design in Burlington. TruexCullins specializes in environmentally conscious residential, workplace, resort and educational architecture — including working abroad in Africa, Asia and Europe on international schools.

The site

The "siting" of a home — how it is located and oriented to the sun and surrounding landscape — is absolutely critical. A home must be properly sited to take advantage of the sun's ability to give heat and power, along with the earth's capacity for insulation.

South Farm is located on a south-facing hillside that acts as a solar sink. The houses face directly south and are "bermed" (slightly sunk) into the hillside, which provides natural insulation from the earth on three sides of each building. This creates a "mini-climate," where on any given day in winter the temperatures on the south face of these houses can be much warmer than those of the surrounding areas.

Connections to local services and transportation also must be considered when choosing a house site. South Farm is within easy walking distance of Hinesburg village. You don't need to get in the car to get a newspaper, and you also get the benefit of stretching your legs a bit.

The envelope

The thermal envelope of a house consists of the exterior walls and ceiling or roof surfaces. Here in Vermont, these are the areas that need to be insulated from the outside cold in winter.

The science of insulation — how much insulation to use and how tight to make a house — has come a long way, even in the past 10 years. We now understand that the way to control moisture, which can cause mold and decay in walls, is by making a home very "tight" and controlling the air that comes into and out of the house. This is accomplished by using a small air handler

called a heat recovery ventilation unit, or HRV.

The HRV unit exhausts stale, warm air and recovers its heat by using a double-shelled duct to exchange the heat from the outgoing air to the incoming fresh. This device uses little energy and runs almost continually at extremely low volume. As a result, the air quality in these super-tight homes is excellent.

What is the best insulation value for a net-zero home? We like to see R-values of R-20 for foundation walls below grade, R-40 for exterior walls above grade and R-60 for roofs. These values are significantly higher than most energy codes, but they are critical in this case. (The R-value is a measure of a material's ability to conduct heat; the bigger the R-value, the more effective the insulation.)

At South Farm the insulation was accomplished several ways. Dense-packed cellulose was one type of insulation that worked especially well. To construct exterior walls of at least R-40, we used a double-wood-stud wall filled with cellulose insulation and then applied 2 inches of rigid foam to the inside surface of the wall.

The windows

As part of the exterior walls, the windows represent a crucial component of the thermal envelope. Modern technological advances have made it possible to use windows that are as insulative as a typical fiberglass-insulated 2x4 exterior wall, and a lot tighter.

But a window's ability to resist heat transfer is only one part of the equation.

Windows must admit the sun's warmth (passive solar heat) — especially on the

south side of the house — and insulate from the cold. At South Farm we used double-glazed windows on the south walls (which insulate well but also let in a fair amount of solar heat) and triple-glazed windows on the other three sides for better insulation.

Typically the most glazing should be on the south-facing walls, and the least on the north. The roof overhangs also must be sized to allow maximum sun in the winter and maximum shade in the summer, so the house doesn't overheat.

Energy technology

Electricity at South Farm is generated by photovoltaic panels, which are laminated to the standing seam metal roofs of each house. The roofs are at a 45-degree pitch, which is nearly optimum for stationary photovoltaic panels in northern Vermont.

All the homes are on the electric grid. In summer there often is a surplus of usable electricity, and so the homes feed back energy into the power grid. And on cloudy winter days, energy may then be drawn from the grid. No batteries are used for storage.

Most of the houses are heated by a combination of passive solar energy and geothermal heat pumps. These geothermal heating systems pump water out of an artesian well, extract heat out of the water via a heat pump, then return the cooled water to the well. The extracted heat is delivered to the rooms via hot water that is circulated through lightweight concrete floors, for radiant floor heating. Most of the houses have back-up wood stoves for those times when there is a power failure and a cloudy day.

On some of the houses at South Farm, domestic hot water is heated by solar hot-

water panels also mounted on the roof. Others have domestic hot water partially heated off of the geothermal system. All have electric back-ups.

Size of the home

There is a direct correlation between the size of the home and its potential to be truly net-zero in terms of energy use: Generally speaking, the larger the home, the more energy it takes to run.

The houses at South Farm are between 1,500 and 2,200 square feet of heated space. Although it is possible to go as high as 3,000 square feet and be close to net-zero, the amount of energy-generation equipment needed might start to become impractical or prohibitively expensive.

I like to think of these houses not only as beautiful and healthy places to live, but also as mini power plants in their own right. Imagine how much energy could be saved if all housing developments in our country were constructed according to these principles.

In our residential practice, the shift in the past five years has been seismic: Virtually all of our new house projects in Vermont are built using the above principles. And we see the trend continuing, both in single-family and multifamily developments.

We are truly on the cusp of a new era of building. The future is here — and it looks green.

The South Farm Development in Hinesburg was a collaboration between TruexCullins and Reiss Building. Developer and contractor Chuck Reiss can be reached at vbrraiss@gmavt.net.