

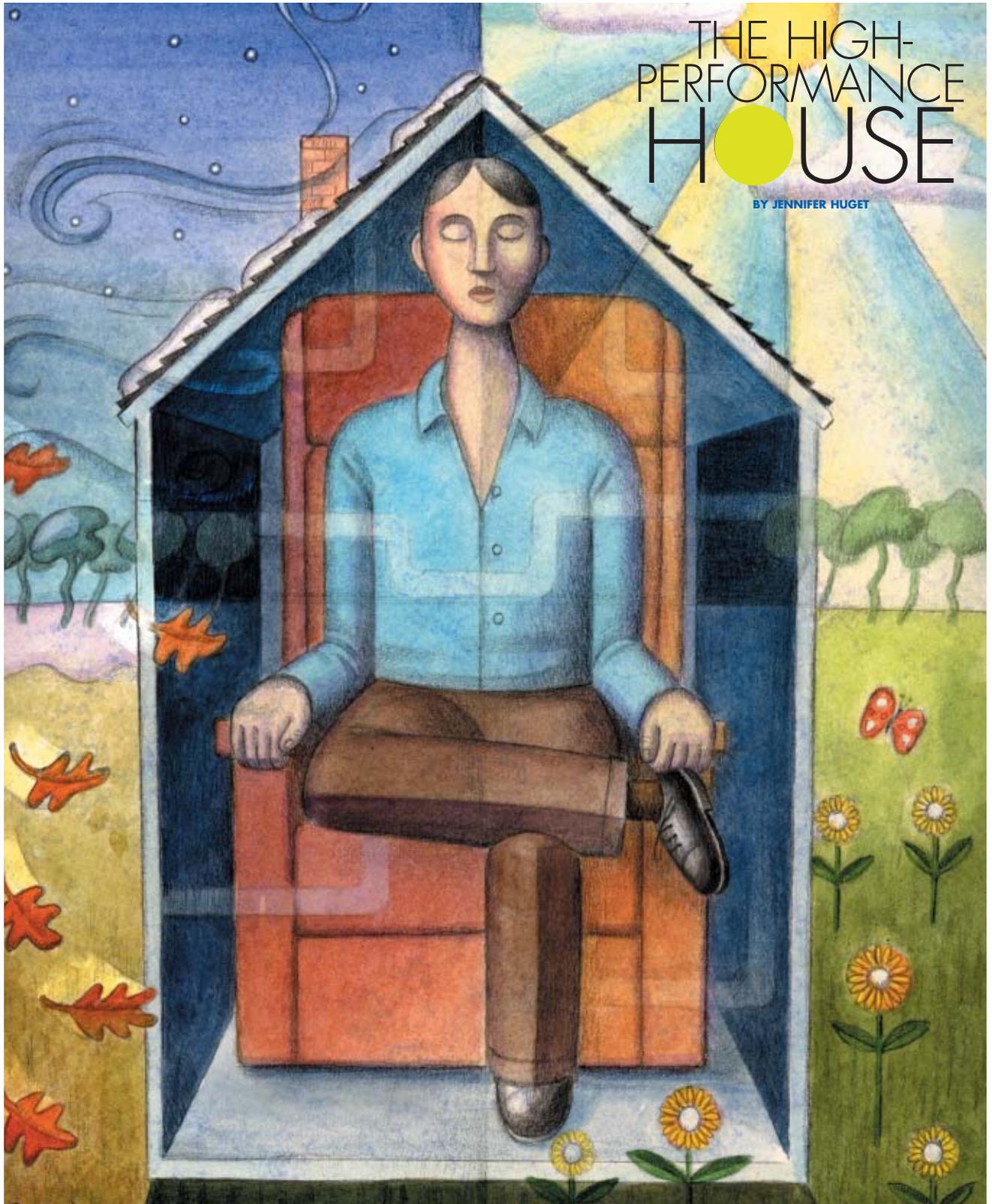
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MAGAZINE

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## THE HIGH-PERFORMANCE HOUSE

BY JENNIFER HUGET



When you go shopping for a builder, you don't expect to end up talking philosophy. But if Mike Trolle is the builder at hand, you're likely to spend as much time discussing the principles that guide his work as you are counting closets and square footage. Maybe more.

Trolle's Ridgefield-based Building Performance Construction Services (BPCS) is one of a handful of companies nationwide that have made energy efficiency and environmental friendliness priorities in building and remodeling homes. But don't worry: He's not going to try to talk you into slapping solar-collection panels across your roof or collecting rainwater in a cistern. Trolle's goal is to integrate the latest, scientifically proven healthy-house technologies into your home in such a way that you'll hardly know they're there.

money—and even heartache—down the road. In creating what he calls “high-performance” houses, Trolle points to one critical consideration: the tight control of the movement of air, heat and moisture in a house. That control, he maintains, sets the stage for comfort, safety, durability and easy maintenance.

While others may offer high-tech gadgets and gizmos in designing “smart” homes, Trolle doesn't think fancy alarm systems, intercoms and other such devices are where the action is. “If you were to ask me,” he says, “high-performance is the definition of what an intelligent house should be.”

Trolle's brand of high performance starts with the establishment of an airtight exterior “envelope,” a key step in the effort to control the movement of air between the inside and the outside of the house. Once the outer envelope is in place, Trolle's approach calls for

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**ADVICE  
ON HOW TO  
BUILD OR REMODEL  
A HOUSE THAT'S AS SMART  
AS YOU ARE.**

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But you'll know they're there, he says. You'll know it every summer day when the air conditioning keeps you comfortably cool without blasting you back into your parka. Every winter morning when the air inside your house feels neither too dry nor too damp. Every time you pay a utility bill, which Trolle's handiwork can reduce substantially—by more than \$1,000 a year, he claims.

And when it comes time to sell, the American Appraisal Institute recently found that for every dollar spent on increased energy efficiency, homeowners realize \$20 of increased resale value.

Trolle's basic precepts are that a house can be both beautiful and energy-efficient, and that thoughtful planning and attention to detail up front will save

“intentional ventilation for the occupants” (providing fresh air for the interior without drawing that air through the walls and the building materials behind them), dedicated oxygen sources to fuel combustion in furnaces or fireplaces, and reliable means of keeping carbon monoxide and radon from entering.

Though energy efficiency is Trolle's abiding passion, he keeps his eye on other issues as well, including aesthetics, comfort—and, especially, safety. “When you have a leaking house envelope and duct system, it can pull combustion products out of flues and back into the house,” he says. Such flaws can lead to carbon monoxide or radon poisoning or to the development of toxic mold, which, though it often lies unseen behind walls and in basements, can cause serious illness and trigger allergic reactions.

The idea that airtight houses contribute to illness by trapping toxins inside is something Trolle believes is “180 degrees dead wrong.” In fact, he says, it is *only* an airtight envelope that can enable the precise manipulation of the pressure relationships between the interior and exterior atmospheres, a process that’s essential in controlling not only air flow but moisture, a culprit in many house maladies, some cosmetic, others structurally dangerous, and others, like toxic mold, threatening to occupants’ health.

Trolle, whose five-year-old company has built five new houses and reconstructed a sixth, maintains that high-performance homes, though they cost about 5 percent more to build than conventional construction, can be big money-savers in the long run. Beyond those reduced utility bills and increased resale values, people with chronic health problems such as asthma may even realize savings in health-care expenditures.

**A  
TRULY SMART  
HOUSE SHOULD BE ABLE  
TO DEAL EFFECTIVELY AND  
EFFICIENTLY WITH EACH OF  
THE FOUR SEASONS**

**ILLUSTRATION  
BY JIM BLISS**

It’s one thing to apply Trolle’s principles when you’re starting from the ground up and building a new house from scratch. But what does he have to offer those of us who want to remodel our old, drafty, low-performance digs?

His brother Christopher has an answer for that. For \$125 an hour, Chris Trolle will take a good look at your house and offer ideas for making it a healthier, more energy-conscious place to live. In two or three hours, Mike says, Chris can give you a pretty good sense of direction.

“The principles of physics—air, heat and water transfer—are the same for an existing house as for a new one,” Mike Trolle says. “You may not have the same opportunities to get it perfect,” he acknowledges, “but that doesn’t mean you can’t do it.”

A typical consultation leads to what Trolle calls “a long laundry list” of potential improvements. That list often starts at the top: the attic, which Trolle calls “an easy area to address.”

“Attics are usually unfinished and unconditioned,” he says. Simply sealing any unintended air leaks and adding insulation can make a big difference for relatively little effort and expenditure. Similarly, adding storm windows on top of single-glazed window panes and adding energy-saving sashes can keep the transfer of air between indoors and out to a minimum. But don’t expect the full 50 percent reduction in heating bills that some promise. The extent of the energy savings

achieved by this improvement depends on how much of your home’s exterior surface is window. A 20 percent saving may be more like it.

Insulating exterior walls can up that savings considerably, as can simply plugging up “cavities in the building that are open to the outside, which are often in funny places people don’t think about,” according to Trolle. “If you know where to look, you can go around the building looking for those issues and seal them up,” he says.

Another place to look for leaks is your friendly fireplace. “Open fireplaces can be very energy-inefficient,” Trolle says. To make fireplaces in older homes more efficient, you can retrofit them with a dedicated source of supply air—air for them to burn instead of stealing warm air from your house—and adding an airtight enclosure. Making those changes, he adds, will allow you to enjoy the fire’s radiant heat without the fireplace being “counterproductive.”

Leaky ductwork and other facets of conventionally installed heating and cooling systems can be major energy drains, too, he notes. “Air ducts in unconditioned spaces in attics or basements can leak about 20 percent to 40 percent of the air they carry,” he explains. If those mechanical systems need to stay in the unconditioned spaces, he recommends adding insulation and tightening connections to stem the tide of air loss.

If the Trolles’ laundry list starts at the top of the house, it continues straight down to the bottom. Damp foundations lead to moisture and mold problems and often result from deficiencies in the gutter and leader system. “You’ve often got rainwater percolating down into the basement,” Trolle says. His brother’s inspection includes an evaluation of the way the ground is graded around the house—a factor that can be fairly easily rectified. “The surrounding ground needs a 5 percent pitch for 10 feet, to encourage water to percolate down in the space around the house” and not the basement.

Trolle suggests that anyone interested in transforming an ordinary house into a high performer start by consulting his Web site ([www.bpcsbuilder.com](http://www.bpcsbuilder.com)), which devotes a whole section to debunking energy-efficiency myths. For instance, the site notes that fiberglass batts aren’t all they’re cracked up to be as insulation products, since they’re almost impossible to install without leaving lots of heat-losing gaps. And for those who think wintertime’s dry indoor air is caused by forced-air systems and that humidifiers will solve the problem, the site counters that the air is dry because there are tons of tiny holes in the exterior walls and ceiling. Plug up the holes, and the humidity level should be fine. Humidifiers, Trolle believes, just lead to condensation and mildew growth.

So if energy-efficient, high performance houses are such a great idea, why isn't everyone doing it?

To Trolle, it's a matter of supply and demand. "You'd think architects would be trained in this, but only a small percentage of them are trained in building science," he notes. As for builders, he says, "most don't want to be bothered. You can hide so many things behind finished walls. And consumers don't demand it. We want to cut corners on the things we can't see. We don't have the same expectations for our homes as we do for our cars."

"People look at their houses and see elegant finishing systems, but it doesn't dawn on them that it could have been put together so much more intelligently," he says. "We're ending up year after year with homes that are not nearly as good as they ought to be."

Trolle thinks demand for high-performance houses will eventually rise, as more builders adopt the kinds of practices he now uses and make them available to

customers. And while there's not a lot of demand out there at present, he thinks there's "latent demand" among potential customers who just don't yet know what they're missing.

"You can't tell me that people wouldn't be delighted to have this stuff in their house without doubling the price," he says. "But until they start asking for it, I doubt construction companies will change. You change when you're forced to change."

In the end, keeping up with the science of high-performance homebuilding may require more effort than some want to expend. "You aren't going to get it from what your dad taught you when you went into his construction business," Trolle says. "You can't do it without studying. There's not a thing here that I've developed on my own, but I've studied it a lot."

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Where "No Compromise" homes are crafted

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