



Efficiency the exception

Green techniques rare in home building

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It isn't easy building green.

Just ask Rob Sabin, of Aspen Homes of Colorado.

The U.S. Environmental Protection Agency named the company the 2006 Energy Star Partner of the Year "for its outstanding contribution to reducing greenhouse gas emissions by building energy-efficient homes."

Sabin is research and development director of the Loveland-based builder. The company his father, Jim, founded had built standard production homes for two decades when in 2001 it went green.

"Every subcontractor fought him tooth and nail. Said he was crazy," Sabin said.

"The first two years we did it, half the time people didn't know what they were buying because we weren't good at conveying information and people just wanted different countertops or different paint," he said.

Things haven't really changed. Despite building codes mandating energy efficiency in the city of Boulder and other local communities, green building is still the exception at the county's fringes where growth is booming.

By and large, the combination of home buyer ignorance, lax building codes in high-growth areas and lack of builder commitment to energy efficiency are guaranteeing a "chill factor" for decades to come.

Weather stripping and digital thermostats enjoy fleeting fame each winter, when boosting energy efficiency to cut heating costs becomes a pastime more pervasive than even Sudoku.

The behavior is rational. Our homes, by and large, were built when energy was cheap. It remains far less expensive to weather strip or wear slippers than to demolish and rebuild the single-family-home equivalent of a Hummer SUV.

With rising natural gas prices and the popularity of "energy independence," one might think new homes would be different. More than 1.6 million single-family dwellings were built in the United States last year, more than 40,000 in Colorado, the U.S. Census Bureau says.

Each presented an opportunity to build energy efficiency and cut heating and cooling bills by a third or more for generations. Green building the production of what advocates call "high-performing homes" saves money, conserves fossil fuel and is easier on the environment.

ON THE WEB

[The U.S. Department of Energy's Building America program](#)

[U.S. Department of Energy's Building Energy Codes Program](#)

[The U.S. Environmental Protection Agency's Energy Star program](#)

[E-Star Colorado](#)

[Colorado New Home Choices](#) (The city of Fort Collins and E-Star Colorado's energy efficiency guide for new homebuyers)

[Coloradoenergy.org's R-value table for construction materials](#)

[Oak Ridge National Laboratories Buildings Technology Center](#)

[Lawrence Berkeley National Laboratories Home Energy Saver](#)

"It's a lost opportunity," said Howard Geller, executive director of the Southwest Energy Efficiency Project in Boulder. "These homes are going to be in place for 50 or 75 or 100 years, consuming precious energy resources year after year."

Building in efficiency doesn't have to cost much. A builder skilled in energy-efficient construction techniques can boost a 3,000-square-foot home's energy efficiency by 30 percent for an extra \$3,000 up front, said Ren Anderson, project lead for the U.S. Department of Energy's Building America program at the National Renewable Energy Laboratory in Golden.

In general, green builders say an additional 1 percent to 2 percent in construction costs up front can build in 30 percent to 40 percent greater energy efficiency.

Bruce Philbrick owns a \$230,000 ranch built by Aspen Homes in Loveland. The 1,220-square-foot home has a hot water heater, dryer, range and furnace all powered by natural gas. His January gas bill was \$44. Xcel Energy spokesman Mark Stutz said the average customer's gas bill was \$142.

"I think buyers out of necessity will have to dial in on this," said Philbrick, who bought the home primarily because of its small environmental footprint. "Just the sheer cost of heating our homes is going to wake up folks to ask if there's a better way."

A drive around the neighborhood

An energy-efficient home has many facets: insulation and window quality, sun exposure, the air-tightness of ducts, furnace quality, the state of a home's overall "envelope" seal, and lighting and appliance choices are a few examples.

But on a drive around a few of the area's many residential construction sites, it's walls you can see, and walls hint at the overall energy-efficiency of a home.

The walls in the production homes going up in Erie are thin, whether the builder is D.R. Horton, Richmond American, Standard Pacific or Morrison Homes. They are framed with 2-by-4s, which in fact are 1 1/2 inches wide and 3 1/2 inches deep.

That's the historic norm in America, and it is outdated in the eyes of the U.S. Department of Energy and legions of energy-efficiency experts. A 3 1/2-inch wall doesn't leave much room for insulation. It also requires vertical studs to be spaced about 15 inches apart.

In contrast, the "advanced framing" techniques viewed as the future in wood-frame construction use 2-by-6 wall studs (in fact 1 1/2 by 5 1/2 inches) with about 2 feet between them.

More thickness means more insulation. More space between wall studs means less wood, which is good for forests and heating bills. Lumber is a lousy insulator, three times less effective than standard fiberglass insulation. Unless an additional rigid-foam barrier separates the stud from the planks forming a house's shell, wooden studs short-circuit insulation, ushering cold straight into the house.

Data from Oak Ridge National Laboratory and a model of a 3,000-square-foot Boulder-area home developed by Boulder energy-efficiency consultant Larry Kinney show a 13 percent reduction in annual heating costs simply from advanced framing.

That's more than \$4,600 over the life of a 30-year mortgage. Line the walls with an inch-thick layer of rigid polystyrene foam and you save another \$1,620 over that period.

The Department of Energy says advanced framing uses the same amount of wood and costs about the same as traditional walls. But builders must assume the up-front cost of changing from 2-by-4 framing, which can vary depending on framing subcontractors or material suppliers.

Jeff Christian, director of the Buildings Technology Center at Oak Ridge National Laboratory in Oak Ridge, Tenn., said there was "some willingness and some experimentation, but generally when you talk about production housing it's hard to make those major jumps."

So thin walls don't just happen in Erie. Ryland Homes' 72-unit Stone Canyon development in Lyons also is using 2-by-4s. But last year, Erie issued 743 building permits for single-family detached homes, 661 in southwestern Weld County and 82 in Boulder County. By comparison, the city of Boulder issued 77 such permits.

Erie officials say their town could grow from 14,000 to 60,000 residents in the coming years. Most will live in single-family homes, and most will be in Weld County. According to the Denver Regional Council of Governments, the southwest region of Weld County had 24,000 homes in 2005. In 25 years, there could be nearly 85,000 homes and 200,000 people in the area.

Building codes are local. Deb Pearson, Erie's community development manager, says the town is considering changing its version. But for now Erie still uses the 1997 uniform building code.

Geller, of the Southwest Energy Efficiency Project, said, "It's a tragedy if they have a badly outdated code like the 1997 code, and these thousands of homes are energy-wasteful."

Geller's organization helped push Denver, Phoenix, the state of Utah and key Nevada municipalities to adopt something far more strict: the International Energy Conservation Code.

Megan Edmunds, executive director of E-Star Colorado in Denver, said a statewide survey by her organization showed that about 80 percent of the population lives where the International Energy Conservation Code is now in place.

But many, Denver and Boulder among them, were largely built out before the better code took effect. No community in southwestern Weld County, besides a bit of Longmont, uses it.

Edmunds said her organization has changed strategy from pushing for better codes to enforcing "very weak, very low compliance rates" to the more stringent codes in place.

Boulder, Boulder County, Broomfield, Lafayette, Longmont, Louisville and Superior also have adopted that code, with Boulder's Green Points Building Program requiring even more in terms of energy efficiency. To comply with the international code in this climate, 2-by-6 walls are almost universal, said Jeff Dwight, assistant building official for Boulder County.

Models of efficiency

Still, most green builders consider the building codes a starting point. Eric Doub's family of four lives in the best-insulated home of about 30,000 ever tested in Colorado, receiving an Energy Star rating of 97.7 of a possible 100. The U.S. Environmental Protection Agency gives its Energy Star distinction to new Colorado homes rating an 80, which is 20 percent more efficient than the 2004 International Energy Conservation Code requires.

Doub, who owns Ecofutures Building Inc. in Boulder, calls the north Boulder home Solar Harvest. It is a brightly lit thermos of a house, so sunny and well-insulated that it has tapped its solar-hot-water heating system just seven times all winter. Its windows are better insulated than the walls in most new production-built homes.

Doub has 2-by-6 walls with expandable Icynene foam insulation that prevents leakage and is 30 percent better insulating than standard fiberglass. There is a layer of 1-inch rigid-foam insulation between the walls studs and the oriented-strand-board planks forming the home's shell and so-called "resilient channels" to break the conductive connection between wall studs and the drywall inside.

Comparing Doub's million-dollar home to a starter house in Erie is comparing a Ferrari to a Ford Mustang. But Doub says many of the features can be done at reasonable expense.

"They haven't tried," said Doub, referring to many production builders. "They haven't even gone down the road at all from the equivalent of 8 miles per gallon, to see what it costs to do a 20 mile-per-gallon house."

Some have tried and succeeded. Boulder's Markel Homes, which is proposing a 492-unit development in Louisville, builds Energy Star homes. So does Aspen Homes. Aspen still builds with 2-by-4, said Sabin, but Aspen sheaths the walls with insulating rigid foam.

Their starter homes in Fort Collins begin at \$215,000 and burn between \$500 and \$1,200 less in natural gas each winter than comparable homes, Sabin said. They cost Aspen between \$3,500 to \$5,000 extra up front.

"Our take is that if somebody like Aspen can do it for the starter market, then it can be done with any segment of the market," said Doug Swartz, engineer with Fort Collins Utilities and longtime efficient-building advocate. "The builder just has to want to do it."

Louisville-based McStain Neighborhoods builds Energy Star homes and went to 2-by-6 construction in walls in 1996, said Jeff Medanich, McStain's special projects manager.

He said McStain recently moved a 100-year-old Loveland barn that was framed with "advanced framing" techniques. "These are not new technologies. They worked hard for each piece of wood and old-time framers thought hard about every piece they cut."

McStain tests all homes with a blow door to ferret out drafts, blasts ducts to spot leaks which cost typical homes 20 percent of their heating efficiency and installs condensing furnaces that are 30 percent more efficient than conventional models. The furnaces have the added benefit of eliminating the risk of carbon-monoxide backdraft present with conventional furnaces.

Medanich estimated it costs McStain between \$2,000 and \$5,000 more per house to build efficient homes.

"With higher energy costs, the payback is shorter and shorter," he said.

If such moves boost efficiency by 30 percent over traditional construction, they pay off in six years to 15 years in natural gas heating costs alone, according to Kinney's model a fraction of a home's life.

Even if a 15-year payback is a blink in the useful life of a house, people move. The EPA's Energy Star program advocates selling the idea that lower energy costs are a form of annuity alongside such terms as "finished basement" and "hardwood floors."

Making green the scene

Granite countertops are visible to prospective buyers; wall framing is not.

"Some are wanting to know about the efficiency, but right now honestly it's more about what I can get for my dollar," said Jennifer Taylor, senior sales associate for Morrison Homes at Erie Commons, which is selling homes from the high \$200,000s and up. "I think more builders would entertain it if buyers would call out for it."

Building codes also make a difference.

"If the jurisdiction you're building in doesn't require it yet, builders aren't going to do it yet," Taylor said.

Representatives from Ryland Homes and D.R. Horton did not return requests for comment. A Richmond American spokeswoman reviewed the e-mailed questions related to energy efficiency and said the company declined to answer them.

Richmond American, Ryland, D.R. Horton, Morrison and Standard Pacific together sold about 100,000 homes across the United States. Just a fraction of them, in select markets, are Energy Star-rated.

Such massive production dwarfs that of local energy-efficient builders such as McStain, Aspen and Markel, who build fewer than 700 homes a year combined.

Swartz, of Fort Collins Utilities, said it's easy to criticize the building industry, and perhaps for good reason.

"The reason houses are built this way is not because builders are bad people," he said. "It's because the housing market is built around price and finished materials."

The solution, he says, is "working with the building industry and realizing we're all in this together."

Building codes are important, he said, but market pull from consumers will be essential in forcing the housing industry to change its ways on a large scale.

"It's very important that people in the housing market begin to answer questions that builders are not used to answering," he said.

Oak Ridge's Christian says many home buyers already are asking the right questions.

"Yeah, there are a million things to consider and energy efficiency is only one," Christian said. "However, in some markets in Texas and in Arizona the consciousness of the market is so high that you can't sell yesterday's house."

For Aspen Homes, the transition to green building wasn't easy. Company founder Jim Sabin died of a heart attack in 2003 just as it was taking shape.

Rob Sabin said he and his brother Jammie are carrying the torch.

"Basically, it was a decision that my father made; he said, 'This needs to be done for my children and my grandchildren and I'm doing it.'"

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