

The passive house

St. Helena architect looks at a growing environmental alternative

By MAUREEN MCCABE
Register Correspondent

I grew up in a drafty, plaster-walled house in the western Pennsylvania snowbelt that relied on a cranky furnace blasting hot air through baseboard registers, while we relied on heavy layers of blankets to make it through the night, and wool sweaters to make it through the day.

The heat in the house was lost continuously through poorly insulated windows, walls, floors and ceiling. Like many American homes, it was, and still is, a ravenous consumer of fossil fuel.

But imagine a warm house in winter where your children play comfortably in T-shirts, where the warm walls and tile floors are only a couple of degrees different from the air in the room, where fresh air circulates, and your current energy costs are cut by up to 90 percent.

Now imagine there is no furnace. Imagine that the heat in the home comes primarily from light bulbs, appliances, computers, even your own body.

Is this science fiction dreamed up by Isaac Asimov?

Not at all. It is a passive house, or German *passivhaus*, from a movement launched in Germany in the 1990s to reduce energy consumption. It focuses on how efficiently we can keep heat in a home, and save energy, rather than on what dwindling natural resource we can use to heat it.

In the passive house, gone are thermal bridges, areas where heat escapes due to poor insulation. Energy conservation is achieved with an air-tight, super-insulated envelope surrounding the home, including the foundation. A continuous layer with no cracks ensures that no heat can escape. The airtightness is verified by a blower door test that pinpoints chinks in the armor.

Triple-glazed windows with super-insulated frames, thicker wall insulation and studs spaced further apart are some methods used to conserve heat already generated in the house by electrical objects and people.

Site selection, including south-oriented windows, shading in summer and freedom from shadows in winter, ensures passive solar energy and warmth.

But a crucial component of the passive house is a heat recovery ventilator that recycles heat. “The point is to capture heat, and recycle it,” said Nabih Tahan, a San Rafael architect with Bau Technologies who retrofitted his Berkeley house using passive-house standards.

The ventilator has two fans. One sucks fresh outside air through ducts into the bedrooms and living room, while the other sucks stale, moist or smelly air out of ducts in the kitchen and bathroom, Tahan explains. In the process, heat is exchanged, so it does not leave the house.

Although this hermetically sealed atmosphere may sound stuffy, advocates claim the air is fresher in a passive house than in a normal house because air is constantly circulating. And even in a passive house, windows can be opened.

The passive house has “redefined the standard for a quality building,” according to Graham Irwin, principal of Marin-based Essential Habitat Consulting and one of the first certified passive house consultants in the U.S. He calls its levels of efficiency, comfort and indoor environmental quality “unprecedented.”

It took a physicist, Dr. Wolfgang Feist, to refine the passive house concept and build the first model in Darmstadt, Germany, in 1991. Much has been learned since his first boxy experiment. Today, passive houses are impossible to identify by simply looking at the outside.

Right now in the U.S. there are only a handful of passive houses in Illinois, Massachusetts and Minnesota. That will be changing. The Passive House Institute in Urbana, Ill., is offering training courses leading to certification as passive-house consultants in seven U.S. cities, including Berkeley in the Bay Area.

St. Helena architect takes on the ‘passive’ challenge

In the Napa Valley, Jarrod Denton, an architect with Lail Design Group in St. Helena, has just finished the class and will soon take the certification test. He was one of five U.S. architects attending the 13th annual Passive House Conference in Frankfurt, Germany, earlier this year, according to Denton.

He returned to St. Helena excited about the possibilities the passive house brings to his architectural practice. Denton is a LEED-accredited professional who helped design Hall Winery’s production facilities, which recently became the first winery in Napa Valley to receive LEED gold certification.

LEED, or Leadership in Energy and Environmental Design, is a voluntary certification program adopted by the U.S. Green Building Council. It awards points for categories including using a sustainable site, water efficiency, energy use, materials and indoor environmental quality.

Denton is currently in the design stage of a retrofit of an existing home in Sonoma using passive-house standards working with Rick Milburn of Solar Knight Construction, who also completed the passive house training. A complex spreadsheet-based design tool, the Passive House Planning Package, is used in this phase to calculate the energy balance of the building. Denton is working with Irwin's firm for this service.

To Denton, passive-house standards encourage creativity, not constriction.

"The architecture is not compromised," Denton said of the passive house, stressing that "visually, it won't look any different than any other house." There will be less noise in a passive house because it is better insulated than other buildings, Denton points out. "Indoor air is healthier, with a lower particle count," he adds.

Although construction costs for passive houses in the U.S. tend to be about 10 percent higher than a normal house, Irwin says, savings in energy over time more than recoup the initial investment.

In Europe, costs are only 1 to 4 percent higher, according to Denton, because many manufacturers have shifted their mass-produced products to reflect passive-house standards. As an example, Denton points out that "triple-paned windows are becoming the standard glazing. If you want double, you will not save money since the shift has already occurred."

There are now about 15,000 passive houses globally, most in Europe or Scandinavia, according to a December 2008 article in the New York Times. Indeed, the European Parliament resolved last year that all new buildings should meet passive house standards by 2011. In Germany, where the passive house is widely accepted, the U.S. army will be building 22 passive houses as part of a 520-unit housing complex in Ansbach.

Although the LEED standards are extremely beneficial in getting people to think about sustainability, some passive-house enthusiasts believe the standards do not go far enough in reducing energy consumption. "We have to change the way we think about houses and energy," Tahan said.

Initiatives such as the PG&E- and Affordable Comfort-sponsored Thousand Home Challenge, which seeks 70 to 90 percent reductions in energy use, and the California Energy Commission adoption of the

Public Utilities Commission plan to be net-zero energy users by 2020, are approaching the European mindset of energy reduction.

The benchmark for heating energy demands in a passive house is not more than 15 kilowatts per square meter per year. Traditional homes can be 10 times that, or more.

“Daniel Libeskind says an architect is like a conductor,” Denton said. “Lighting, heating, electricity, comfort, proportions, acoustics, water efficiency, landscaping, interior design,” these are all the elements architects use to create harmony. “Passive-house standards become another instrument to include in the symphony.”

Napa Valley Register Copyright © 2009