

Features

The Marriage of Prefab and Sustainability

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By [Sarah Fister Gale](#)

'Green' has found an unusual mate in the housing market.

While they may seem like an odd couple, prefabricated housing -- in which most of a home's structure is pre-built in a factory then assembled on-site -- is an oddly natural partner for the green movement. Prefab or modular homes can be produced and erected more efficiently, consume less energy and generate less waste than the construction of conventional homes.

The surprising thing is that today's prefab housing is also beautiful, customizable and designed to fit naturally into its surroundings. In the past decade, prefab housing has transformed itself from ugly, concrete, cookie-cutter sub-divisions into elegant, sleek and stylish homes where sustainability is a natural part of the construction process.

Uniformity Breeds Quality

The \$9 billion prefab industry produces about 140,000 factory-built units annually, according to Bruce Savage, vice president of public affairs for the Manufactured Housing Institute.



MK Designs' MKLotus house, on display in front of San Francisco's City Hall during the West Coast Green conference.

Ninety percent of prefab homes are built in factories where skilled craftsman typically work regular nine-to-five shifts assembling pieces of the structure using uniform manufacturing processes on a level surface, rather than a potentially uneven construction site. The pieces are trucked to the site where they are erected on a poured foundation in a fraction of the time it takes to construct a conventional home.

While many people may feel suspicious of the quality and reliability of prefab building strategies, modular homes are constructed according to conventional building codes required by the state, county and municipality where the home will reside. They are not otherwise restricted by building or zoning regulations, says Jeremy Bertrand, executive director of building systems councils for the National Association of Home Builders in Washington, D.C., which now offers its members a voluntary green building standard designed as a tool kit for builders interested in green building practices.

"They meet the same quality standards as a site built home, and they don't look any different," Bertrand says.

Prefab housing manufacturers are subject to state inspector and independent inspection agency review of the manufacturing process during each phase for code compliance and workmanship. During assembly, local building inspectors ensure the structure meets requirements and the finish work is done properly.

The modules are produced using modern assembly line techniques, which reflect the input from specialists from various facets of the building trades. The streamlined process results in fewer errors and greater efficiencies. "It's a well designed production system," Bertrand says.

Prefab homes also benefit from being assembled in an optimal production environment, says Rebecca Woelke, director of media relations for [MK Designs](#), an Oakland, Calif.-based architectural design firm specializing in sustainable prefab homes.

"The factory craftsmen work together in normal shifts in a quality-controlled environment, not up on a ladder or out in the rain," she says. "As a result, the quality is amazing."

Paperstone and Bamboo

Increased awareness about the sustainable nature of prefab housing in recent years has led to the availability of a more diverse set of materials, and design system and construction techniques. This gives homeowners a broader selection of features and options while offering builders greater opportunities to improve designs and cut costs. Most prefab architects today offer a variety of modules or spaces that can be arranged, added to and customized to create original beautiful homes that meet homeowners' space and quality needs.

"There are infinite combinations with today's prefab models," Woelke says.

Michelle Kaufmann, founder of MK Designs, began building sustainable prefab housing in 2002 in response to her own search for a green home. Frustrated by the lack of affordable, sustainable and well-designed homes, Kaufmann decided to build them herself. Today MK Designs offers clients a portfolio of green prefab designs, each of which can be customized both in layout and materials used.

Her homes are built using a catalog of layout choices and sustainable material options that include Forest Stewardship Council Certified Wood, which has been certified sustainably harvested; bamboo, a non-forest timber product that can grow to maturity in one growing season; paperstone counters made from recycled paper; tile made from recycled materials; open cell foam insulation, which is weather tight and flexible; and low emitting windows and doors.

"Using a catalog of pre-selected materials increases our supplier relationships and makes the design process more streamlined," Woelke said.

The homes have been showcased in a number of museums, including the National Building Museum in Washington, D.C., the Vancouver Art Center, and Museum of Contemporary Art in Los Angeles.

Ordering material in bulk uses less energy to ship product. And at traditional job-sites, leftover materials typically fill a dumpster before getting dumped in a landfill while factory-made buildings produce far less waste because the production environment allows them to reuse and recycle materials for future jobs.

"You don't have guys running to Home Depot twice a week to pick up a stack of two-by-fours," Bertrand says. "If you have leftover materials from one project, it can be used in another home or put in a bin for recycling."

The environmental impact of waste reduction alone make prefab housing a better choice, says Steve Glenn, a modern prefab home developer and CEO of [LivingHomes](#) in Santa Monica, Calif. "Thirty to 40 percent of materials from a conventional home construction project can end up in landfills," he points out. "In prefab construction, it's 2 percent."

LivingHomes was the first homebuilder to achieve the highest rating in the U.S. Green Building Council's (USGBC) new pilot LEED for Homes rating system. The LivingHomes model home is zero energy, zero water, zero waste, zero carbon and zero emissions. "There were a lot of challenges to integrating the LEED program into our design and price requirements, but as a company, we're committed to building some of the healthiest, most ecologically considered production homes available," Glenn says. "We will use LEED for Homes both to clarify what we're doing and why."

LivingHomes modular homes include dozens of green features, including rainwater harvesting systems, high efficiency fixtures, hydronic space heating with solar hot water collectors, ductless HVAC systems, and LED lights. They are also built close to community resources, and have low site impact with erosion controls in place during construction.

"Our clients care about design, health, and the sustainability of the products they use," he says. "Our houses reflect those values. The quality and design speaks for itself."

The Price of Green

Glenn, Woelke and the rest of the prefab industry, however, quickly point out that modular homes aren't cheap, which is another misconception that stems from antiquated modular home stereotypes. Sustainable prefab houses can cost about the same as a conventional home to construct but the quality and efficiency of the finished product is typically better because more of the investment is put into materials and technology rather than on-site construction crews.

Costs for construction vary depending on design, complexity, geographical area and site conditions. Pre-designed homes from MK Designs may start at \$250 per square foot, while custom homes start at \$400 per square foot. This doesn't include the cost of land.

Prefab homeowners will likely pay less for heating and cooling costs over the life of the home because the structures tend to be more energy efficient with less leakage, Bertrand says. "These houses are built to be hauled on a truck to the job site so they have to be durable, and as a result, they are more weather tight."



A green prefab from LivingHomes.



MK Designs' Glidehouse prefab.

Woelke agrees. She estimates that through a combination of good design principals, tighter construction, and energy efficient materials and technology, MK Designs homes can save 30 percent in energy use and 40 percent in water compared to a conventional home, with the possibility of additional savings from alternative energy, such as solar panels.

Energy savings also comes from thoughtful architectural choices. Woelke points to the company's [Glidehouse](#) design, which incorporates sliding wood sun shades to block sunlight but allow a continued breeze. A bank of high windows across from a window wall creates a cross breeze that blows hot air out. "Placement of windows and doors is as relevant for energy savings as the materials you use," she says.

Since prefabricated homes can be erected in weeks rather than months, materials are not exposed to inclement weather during construction, which further curbs dampness

and warping problems. "If you can get a house weather tight in a day, you avoid moisture and mold developing in materials," Bertrand says. "That can a big challenge to get out of a conventionally built house."

Wave of the Future

As more of these elegant, energy efficient prefab homes are constructed around the country, designers expect them to become a natural choice for consumers who make sustainability a priority for all other purchases.

"Prefab leads to green," Woelke says. "It's just a healthier way to build for the planet, and people are beginning to realize that."

Glenn agrees. "People who are serious about sustainable homes know that this is a new generation of prefab," he said. "The quality speaks for itself."

Sara Fister Gale is a freelance journalist based in Chicago.