

In the evolution from basic practicality to a modern aesthetic, prefabricated building techniques have caught up with the 21st Century – incorporating high design with eco-friendly features.

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In 1908, Sears, Roebuck and Co. began selling what can best be compared to today's prefabricated homes via their mail-order Modern Homes program. The company sold more than 70,000 homes by 1940, offering kit-of-parts homes at a variety of sizes and price points (the massive Colonial model, Torrington, went for \$3,189, while the four-bedroom Brentwood was \$869). It was an early harbinger of what was to come: an increasing demand for easy-to-assemble, factory built homes.

The current argument for the practicality of prefabs comes up time and time again. When we order a car, we don't expect it to be built in our driveway, so why expect a house to be built, brick by brick, at the site? Traditional construction involves the raw materials being delivered to the site, and tradespeople starting from scratch and working for months, or even years, while contending with weather and site conditions. In contrast, prefabricated buildings are constructed in components, modules or even as an entire structure in a controlled factory environment, and then delivered to the site to be assembled and connected to the utility grid, often in a matter of days. This method arguably offers a more controlled, comfortable setting for the tradespeople, it reduces or even eliminates material waste, and it opens the door for a more mass-produced approach to dwellings that, down the line, could result in a dramatic decrease in cost.

In recent years, the prefab industry in North America has been gaining momentum. Exhibits like The Museum of Modern art's 2008 show, "Home Delivery: Fabricating the Modern Dwelling," offered an overview of the history of prefabs and furthered the discussion on how the manufacturing process is a major component of the sustainable built environment. The next year, Prefab 20\*20 – a competition that was organized in part by Architecture for Humanity Vancouver and the Architectural Institute of British Columbia – encouraged the envelope-pushing design community to envision innovative new urban solutions. But at the same time, the industry was hit hard by the 2008 recession, wiping out more than a few fledgling companies that were pushing the envelope on prefab manufacturing. Now, as the economy regains momentum. Companies in the United States and Canada – and even across the pond in Europe – are changing the face of the built environment, and of the construction industry itself.



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The wide-reaching spectrum of options culminates with fully manufactured prefabs. Companies like Toronto based Sustain are building fully completed structures that are dropped off at the site via tractor-trailer, and just need to be hooked up to water and electricity. Designed by Toronto firm Altius Architecture, Sustain's miniHomes come in a variety of sizes and can be delivered in about six weeks. "Most people are pleasantly surprised that something like it exists. We are surprised by the reaction as we think it is such a simple idea," says partner/architect Trevor McIvor. "We are trying to prove that sometimes less is more. The excesses of what we see built in some cases is very wasteful."

Building small prefab structures is a particular science, as exemplified by London- and Munich-based company Micro Compact Home, which began as a research project to create a 2.6-metre cube dwelling. A joint venture with the Tokyo Institute of Technology, the resulting homes-designed to stand alone or to be grouped into clusters, horizontally or vertically – abstractly evoke the architecture of Japanese teahouses integrated with the most cutting-edge technology. For a starting price of \$49,000, the unit comes completely live-in ready and can be delivered anywhere in Europe via helicopter or truck; when it's no longer needed, the entire cube can also be recycled back at the factory, or relocated to a second user.

"High-quality prefabricated construction is part of the manufacturing culture of Europe," explains Richard Horden, professor at Technical University Munich and founder of Micro Compact Home. "Car design, aircraft, product design and contemporary buildings are all made up of prefabricated

parts.” Horden’s latest project is what he calls a “Family Compact Home,” which is comprised of several Micro Compact Home (m-ch) cubes, including separate units for the children. “This would be great for showing them how to take charge of their environment from a relatively early age, and the consequences of not controlling tidiness, cost and energy use,” says Horden. The company has also created a completely self-sufficient, solar-powered version – an example of the innovative thinking that inspires the prefab industry.

Modular prefabs follow the same basic ethos of manufactured homes, but on a larger scale. Rather than the whole house being delivered in one piece, smaller modules are manufactured and assembled in a factory setting, then sealed together at the building site. Not only does this allow for more customizable design – potential homeowners can work with the modules to build up the space like Lego – it allows for nearly everything to be done in the factory on an infinitely larger scale. It’s a format readily available by companies across Canada: Bonneville Homes, out of Quebec, offers modern models among its more traditional styles; Manitoba-based Challenger works with noteworthy architects like HIVE, OS1 Architecture and KieranTimberlake Associates to create unique models; while Calgary’s Karoleena Homes focuses on reducing building waste, construction time and energy use to bring its environmental footprint to a minimum.

Like manufactured prefabs, one of the benefits of modular units is their durability. Yes, they’re built in a controlled environment where the tradespeople aren’t dealing with rain, snow or cold, and are working from bridges and platforms rather than being harnessed to the roof, but these structures also have to be built strong enough to last the journey to the job site.

“You can’t cut corners,” says Toronto-based green building consultant Laura Felstiner. “It has to be more structurally sound than an on-site build.” Felstiner recently worked with LivingHomes on its first Canadian prefab. The California company offers a wide variety of modern, mid-century-inspired homes that arrive completely move-in ready and can be assembled at the site in only one day.

Although most of its projects are near its Southern California factory, LivingHomes recently teamed up with Toronto green development firm Nexterra to “Northerize” its plans for a Canadian climate and market. Their first project (shown at the start of this article), a two-storey, 198 square-metre home in the North York area of Toronto, is the first of a four-prefab cluster designed to be a luxury “eco enclave” that represents the higher-end possibilities of prefab construction; the home recently sold for more than \$1.5 million.

The Nexterra project is a perfect example of the benefits

of prefab construction in an urban environment, where traditional building methods can disrupt neighbours and the surrounding community for months, or even years, at a time. While this home took only 30 hours to install on-site last February, even the more complicated installations only take a couple of months at most. Tight footprints and infill sites – which are practically impenetrable by crews and heavy machinery – are easier to maneuver in when a semi-complete structure can be installed with minimal on-site preparation.

For Nexterra owner Gary Lands, tight urban footprints are a strong argument for custom prefabs. “Let’s face it – in urban environments, it’s too hard to pick a model and put it down there,” he says. “You have to customize even the modular stuff to fit the lot. It’s like an off-the-rack suit with alterations.”

For a fully customized installation, panelized prefab systems – sometimes referred to as “hybrid prefabs” – offer precision-engineered building systems delivered flat-packed or in a shipping container as a kit-of-parts that can be snapped together on-site, much like IKEA furniture.

Minneapolis manufacturer FlatPak, for example, offers a variety of wall systems (including partial or full-panel glass, with opening or fixed windows) that can be arranged in myriad configurations, with fully equipped kitchens and bathrooms featuring built-in cabinets. And San Francisco’s project Frog uses parametric design to explore the physical, thermal and economic attributes of its building materials – a highly flexible kit of steel components – to create the most efficient and precise fabrication processes for their projects in the education, healthcare, public and retail industries. Generating a sixth of the on-site waste of traditional buildings, each project also comes with an energy monitoring system to encourage an ongoing emphasis on efficiency.

David McAdam of Blue Sky Building Systems fabricates intricate light-gauge galvanized steel framing, precision-cut in the warehouse, which saves time and waste on the job site while still offering complete customization. McAdam’s story makes the case for prefabs in fragile environments: His company started when he wanted to build a home on a 2.5 acre lot of land in California’s Yucca Valley. McAdam wanted to preserve the desert terrain he’d fallen in love with – punctuated by giant boulders, pinon pines and twisted junipers – rather than work against it.

“The typical way we build homes is very destructive,” McAdam explains. “You end up doing a lot of collateral damage.” Rather than have a crew demolish the surrounding environment while trekking to the site for a year, or longer, he worked with a manufacturer of prefab light-gauge galvanized steel to create a property embedded in the landscape. It took only eight weeks to build – “with no telltale demilitarized zone surrounding it,” McAdam says. “The light touch on the

land got me intrigued.” More than five years later, McAdam is using his efficient pre-cut steel system to build homes across the U.S., and is eager to try his hand at the harsh Canadian climate in the future.

Opting for steel instead of wood framing for single- and multiple-family dwellings is certainly gaining momentum, and Quebec-based BONE Structure offers the utmost customization. Its dwellings, made of lightweight recycled steel framing that snaps together on-site, come in a wide range of sizes and styles that’s always growing. And the flexible framework allows for walls and panels to be removed or relocated without impacting the overall structure, allowing for future expansions or reconfigurations. The 100 percent recyclable steel components are manufactured with the same technology used to cut machined parts for aircraft and automobiles, and they are assembled with minimal tools – essentially, screws and a hand drill, with no cutting required, which minimizes on-site waste.

There is another type of utilization: one-off architectural projects that partially incorporate prefab components for a variety of reasons, such as material availability, environmental concerns or site accessibility. Toronto firm Taylor Smyth Architects, for example, prefabricated floor, wall and roof components for its 213 square-meter Scarborough home, House on the Bluffs. Not only did this cut the installation time in half, the panelized system resulted in a strong structure and minimal material waste, reducing the building cost by \$10,000. The firm also used the prefab method for its Sunset Cabin, which was fabricated in Toronto and then disassembled and rebuilt on-site.

The U.S.-based design firm MOS Architects turned to the prefab technique when building its Floating House on Georgian Bay. Because the location is on a rugged island linked to the mainland by a 20-minute boat ride, the firm worked on the two-bedroom cottage – clad in cedar and Douglas Fir – a few miles away in the contractor’s workshop, and then towed it along the frozen lake to the building site. The cottage, which floats on pontoons, demonstrated the benefits of prefabs in intense environments – allowing for structures to be built in locales that would be otherwise impractical. The firm has since continued to explore the potentials of prefabs on a one-off basis with projects such as its Element House concept, made from structured insulated panels.

The market is indisputable growing. The question is, with so many subcategories, in which direction is it headed? McAdam sees the future in custom fabrication – prefabs designed by architects, not cookie cutter domiciles. In short, moving away from the Sears history and into the modern world of on-of-a-kind architecture. “It’s a tough market for prefabs, but the market will be more embracing if it has the customization element to it,” McAdam predicts.

One of the companies that is on the forefront of modernizing prefab techniques is L.A.-based Taalman Kock Architecture, creator of the itHouse, which takes DIY to the extreme by supplying everything you need to build the structural system, cabinetry and interior walls of a full-size made-to-order home. Buyers start with a simple 111 square-meter plan that can be beefed up with kitchen, bathroom and solar energy packages – and even curtains and furniture. Working with a contractor, the homes are usually move-in ready in 12 weeks, including shipping time.

The problem with most custom prefabs, however, is that they actually aren’t that much more cost-efficient than traditional builds. “It’s not as complicated as starting from scratch with an architect and a blank sheet of paper,” says Nexterra’s Lands, “but it’s more complicated than just plopping one down.” Although the whole process is far more predictable than a traditional build – no unexpected costs and minimal delays – the price can still be prohibitive.

The real savings might be in mass or multiple production. European hotel brand citizenM has this approach down to an art. With locations in London, Amsterdam and Glasgow – with new hotels opening soon in New York and Paris – citizen mass-produces its hotel rooms as cube units in a warehouse, which saves on building costs and also allows for new locations to pop up quickly. Other manufacturers are doing similar approaches on a smaller scale, prefabricating bathroom pods that can be installed quickly in dorm rooms or hotel suites.

But for Horden, of Micro Compact Homes, the future of prefabs is dependent on the future of design. “Public reaction will not change until prefabrication of homes can clearly offer a higher quality of life experience for the home owner,” he predicts. “Reduced energy use, remote monitoring – it is just a matter of time and quality in design before homes will be built this way.”

Ironically, it’s easy to argue that the prefab industry actually encourages homeowners to reevaluate their quality of life experience, not to mention their relationship to their surroundings. Perhaps, when your home is shipped to you in modules, you pay far more attention to every inch of space. The projects offer a distinctly modern aesthetic, of course, but an aesthetic rooted in necessity and efficiency. And the bottom line is that once a structure is built, the fact that it was created in a factory setting no longer matters. Although some see the environmental aspects of the efficient manufacturing process as key to the project, many homeowners are focused on the after-effects of prefab construction: the durability, the modern streamlined aesthetic and preservation of the surrounding environment. “At the end of the day, they don’t really care that it’s a prefab,” says Lands. “It’s just a beautiful house.”

