BUILDING FORW>RD

Can Construction Become an Export?

Your next home could be constructed—or at least designed and engineered—half a world away.

by ***Joe Bousquin***

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Looking over his new factory in Modesto, Calif., Gerry McCaughey sees history repeating itself.

The 200,000-square-foot, $35 million facility is ramping up to pump out framing, roof trusses, floors, and panelized wall systems using automated equipment while enabling homebuilders in California's high-demand market to cut overall build time of a house by 33%. Entekra's Fully Integrated Off-Site Solution (FIOSS) enables three workers to take a production home from a bare slab to roof level within three days, compared to 15 days using conventional methods. The new factory will increase Entekra's capacity from a few hundred homes currently to more than 3,000 per year.

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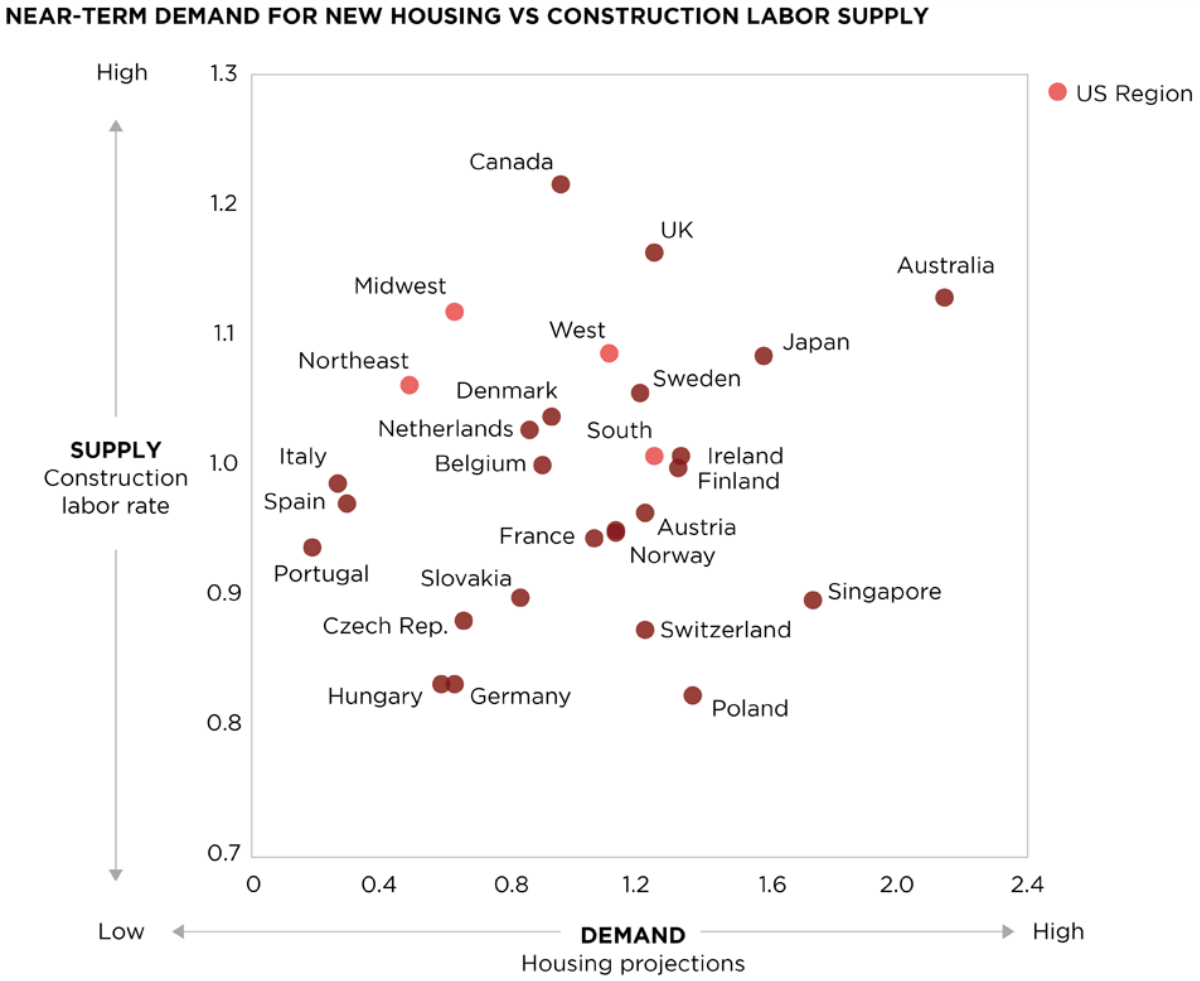
But McCaughey, while a pioneer of automated, off-site production of building components in Ireland and the U.S., is no longer alone. With the construction industry facing a profound, and prolonged, lack of skilled labor on-site, more and more parts of buildings are being produced in factories today. McCaughey sees that trend in construction as eerily similar to what happened in the automobile industry decades ago.

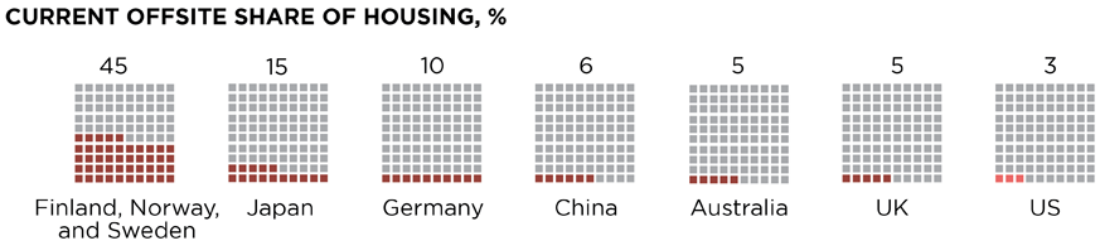
"Back in the '60s and '70s, the Japanese automakers caught Detroit by surprise. That could be the time bomb sitting in the middle of the construction industry in the U.S. that's about to go off today," McCaughey says. "Housing is becoming an export."

Lack of labor, productivity take more jobs off-site.

The construction industry is struggling to improve its productivity relative to other sectors, while hitting a wall in terms of the number of skilled laborers it can find to do work on-site. One approach has been to manufacture parts of buildings in factories, either as modules or using panelization techniques such as McCaughey's, to cut down the amount of labor needed to reassemble the pieces on the final building lot.

While these methods still account for just a fraction of the overall activity of construction in the United States, a new business model is starting to emerge that's shifting the focus of many builds from site-based projects to factory-built products. Indeed, the title of a new McKinsey & Company report on the modular industry, "From Projects to Products," succinctly captures the trend of where construction is headed.





Construction labor rate is construction wage divided by national median wage. Housing projections are 2017–20 average housing projections as a percent of national housing stock. Source: 5 in 5 Modular Growth Initiative (Ryan Smith); ABS.Stat; CMCH; curbed.com; Euroconstruct; HIA Australia; ILOSTAT; interviews; Ministry of International Trade and Industry (Japan); Mitsui Fudosan; Natural Resources Canada; OECD; Prefab Housing (Matthew Aitchison); Roland Berger; UK Ministry of Housing; Urban Redevelopment Authority; US Census Bureau; McKinsey Capital Projects & Infrastructure

"The big differentiator in the construction industry going forward will be a shift from this

principles that have played out in every other sector but have yet to take hold on the construction site."

If McKinsey and McCaughey are right, the implications for the U.S. construction industry will be profound. Buildings, in this new model, will be much more similar to consumer goods, often designed and manufactured half a world away. On-site assembly consulting, along with logistics coordination, will become a much larger part of builders' jobs. And supply-chain optimization, rather than on-site building techniques, will dominate their focus.

"If you're a builder today, you have very good project managers and foremen on-site, but you don't really have the classic, manufacturing supply chain capability that focuses on quality control," says Fuchs. "Builders will need to develop those kinds of capabilities in order to execute in the future."

More U.S. homes and buildings are being built outside the United States. That future isn't as far off as you may think. Indeed, the manufacturing of components—or even entire buildings—overseas and then shipping them into the U.S. is already happening.

Manhattan were built in Poland by modular manufacturer Polcom Group. **Chris Cooper**

At the recently completed citizenM New York Bowery hotel in Manhattan, which at 19 floors and 246 feet claims to be the tallest modular hotel in the world today, the building's 300 guest rooms were built in Poland by Polcom Group, a furniture-maker-cum-modular-manufacturer. The modules were inspected at the factory to ensure they met New York City code and then shipped to New York before being stacked in place. The 100,000-square-foot structure took just six months to erect.

"The shipping costs were actually relatively minimal to the overall project," says Isaac-Daniel Astrachan, principal at architecture firm Stephen B. Jacobs Group and lead architect on the project. "All of the 300 rooms were basically sent over on one ship. So shipping isn't a big issue cost-wise, and the overall pricing of the project was competitive with conventional construction."

Similarly, Pod Brooklyn, a 249-room "micro" hotel where some of the rooms are just 100 square feet, came from Polcom as well. "They weren't cheaper, but they have vast experience in doing hotel interiors," developer Charles Blaichman told ***Real Estate Weekly***. "They had really thought out the engineering part—it was very similar to what we were interested in."

It's not just hotel rooms, either. At Canvas, a 126-unit, two-building mixed-use modular apartment community in Beverly, Mass., developer Chris Koeplin bought the boxes from Quebec, Canada-based RCM Group, which exports modules to the Northeast U.S. and the Caribbean. He cites the quality of product he could get from the Canadian factory, compared to what could be built on-site in the current labor environment. "The quality is just fantastic," Koeplin says. "It's a great way to deliver a building."

And in China, building material supplier WinSun has evolved to 3D print various components of buildings at its factory in Suzhou before shipping those components to be assembled overseas. One of its best known projects is the Office of the Future in Dubai, which it printed in China and shipped in sections to be erected on-site.

Are Detroit's ghosts knocking on construction's door?

homebuilders such as Daiwa House, Sumitomo Forestry, and Mitsui & Co. expanding in the U.S. market in recent years.

"What is it that all of these large Japanese off-site companies see in the U.S. market?" McCaughey asks. "It's very simple. They see a massively inefficient market that they know can benefit from off-site construction. So, even if they're not exporting houses themselves, they're exporting the process. They're going to compete with the domestic stick builders here who refuse to change, which is exactly analogous to what happened to Detroit in the car industry."

An Entekra floor assembly is hoisted into place. Entekra

Modular and prefab manufacturers are planting flags overseas.

Indeed, as the inroads of Japanese homebuilders into the U.S. show, and projects by off-site wunderkind Katerra in India and Saudi Arabia underscore, this new model may not be marked by buildings being shipped into the U.S. from far away locations after all but

"We set up factories in the countries where we have projects, so the building components like wall panels and roof truss systems are produced locally and then flat-packed and shipped to the project site," a Katerra spokesperson tells Building Forward.

Many current modular practitioners in the U.S. already envision a hub-and-spoke model around America's great cities. Under that scenario, housing manufacturers would set themselves up outside major population centers to "import" their products into the end-use markets where they'll be consumed. One of the major factors driving that would be the high cost of overland transportation of modular buildings, which contain mostly empty space. According to McKinsey, that cost comes in at around $45 per square meter over 250 kilometers, or $4.50 per square foot to ship a modular unit 150 miles.

"Transportation is a big issue for modular. Because the units contain so much air, volumetrically they're much more expensive to ship," says Steve Glenn, CEO of Rialto, Calif.-based modular manufacturer Plant Prefab. "For modular to work from just a single, central location, or even being shipped from overseas, there would need to be breakthroughs in transportation."

Indeed, both Glenn at Plant Prefab and Gilbert Trudeau, CEO of RCM Group, which built Koeplin's boxes for his apartment project in Massachusetts, say they're looking to expand their manufacturing capabilities and capacity by building more plants in the U.S.

A view inside RCM Group's manufacturing facilities in Canada. RCM Group

"I look at opportunities in the U.S. all the time, because right now, I have to drive five hours to get to market. Shipping is a huge part of our business, and it's very expensive," Trudeau says. "So I would definitely be looking at going to another location and do the same thing in the U.S., because it's the best market in the world."

His biggest hurdle? Finding the workers with enough skill to set up a new plant.

Glenn says he's currently shopping for new sites with the help of the $6.7 million in Series A funding his firm received from the likes of Amazon and Obvious Ventures last year. "We're going to be building factories closer to the markets we want to serve," says Glenn, who's currently leading a recruiting search for a VP of manufacturing to oversee that expansion.

Rather than the auto industry, Glenn compares the build-out of modular factories near major population centers to the strategy building material suppliers already use. "If you think about companies like James Hardie, or people in the glass business, or concrete manufacturers, they build dozens of plants around the country that are closer to major cities, so it's cheaper to truck their products to market," Glenn says.

Workers review plans inside the Plant Prefab facility. Plant Prefab

Panels keep the world of housing flat.

Of course, another way to solve the shipping hurdle that still aligns with the product model of building and allows components to be shipped over greater distances is panelization, where walls and other components are shipped flat. That's the model McCaughey evangelizes at Entekra. In that scenario, rather than stacking boxes, as now happens with modular, builders would spend a significantly reduced amount of time assembling the pieces of the building on-site, like so much giant Ikea furniture.

That's how Reedsburg, Wisc.-based Friede & Associates, a fourth-generation construction company that traces its origins to the 1890s, is competing in its market today. Since the end of the recession, faced with an endemic shortage of skilled laborers —coupled with the short construction window dictated by frigid Wisconsin winters— Friede has employed more and more panelization into its projects. Doing so has often shaved months off its projects, while allowing it to send smaller crews into the field to get the work done.

"Close to 75% of our wood work is now being done with panelization," says Scott Truehl, co-owner and executive vice president at Friede. "We've got four- or six-man crews that are installing panels and getting houses dried in within a week. That would take them a month if they had just started out with a bunch of lumber."

labor has become an issue for more and more builders, the products Truehl now has access to have become more varied and versatile, too.

Friede & Associates used prefabricated panels in the construction of the Vintage Brewing Company building in Sauk City, Wis. Having the walls panelized and built off site not only helped with the project schedule, but also became necessary as extensive sitework throughout construction left little room for staging and storing of materials.
Friede & Associates

"It used to be, if we were building a closet, we'd have to stick-frame that on-site," Truehl says. "But now, we can get that two-foot interior wall section, too, and save that much more time putting it in."

Another change he's noticed is that he's not the only builder in his area taking advantage of the model—his competition is now using it to bid projects as well. And his suppliers have voiced a willingness to send him products farther and farther from their plants.

"Right now, my local suppliers are within an hour of our place, but they've indicated they will supply us panels anywhere we want to go," says Truehl, who says the panelization module easily lends itself to a larger geographic footprint. "Once you develop a relationship with a supplier, whether that supplier is in Canada or Mexico or frankly, overseas, it's not hard to imagine it expanding on that scale."

The geographic scale over which buildings are being designed, engineered, and constructed today certainly is expanding. Take Entekra's new factory in Modesto. Designers and engineers based at the firm's world headquarters in Ireland, where McCaughey and his father helped transform the way houses were built to use wood-frame panelization, can actually control the equipment on the ground in California, to build the components Entekra ships to its production homebuilder clients.

"The person who controls that machine is a bit like a military drone operator who flies planes over the Middle East from somewhere in Idaho," McCaughey says. "We have people sitting in an office in Ireland who are driving this machinery in California."

Building from half a world away is an apt analogy to what McCaughey sees happening to the broader U.S. homebuilding industry.

"When you think about Sekisui House and Mitsui and Misawa and Daiwa, all these Japanese companies coming here, U.S. homebuilders need to wake up to the fact that this is an invasion," McCaughey says. "Rather than exporting their products, they're exporting their process. They see an arbitrage between the inefficient site-built way homes are built here and the efficient processes they use in Japan, and they're bringing that to the States."

Entekra

And yet, with skilled labor being in such short demand, observers don't see construction

"We're more likely to create construction jobs—as a form of manufacturing—in areas of the country that aren't enjoying the benefits of the overall construction boom currently," says McKinsey's Fuchs. "You'll actually see a net positive impact on both employment as well as on construction productivity."

As the U.S. continues to struggle with finding the skilled labor to construct its buildings on-site and demand for construction across all sectors continues to grow, the likelihood of history repeating itself doesn't seem that far in the future after all.

Joe Bousquin has been covering construction since 2004. A former reporter for the Wall Street Journal and TheStreet.com, Bousquin focuses on the technology and trends shaping the future of construction, development, and real estate. An honors graduate of Columbia University's Graduate School of Journalism, he resides in a highly efficient, new construction home designed for multigenerational living with his wife, mother-in-law, and dog in Chico, California.

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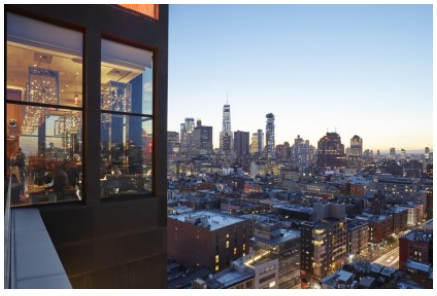

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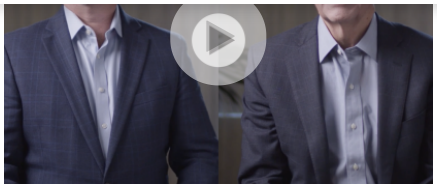

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