



Module construction assembly line.

[Modular Basics](#)

Promoting Offsite to High-Performance Builders

Presenters at a recent EEBA Summit outlined the advantages and challenges of this approach to building.

by Jim Mahannah

- **A controlled factory environment allows for more consistency in details that are important to saving energy, such as air sealing.**
- **It's also quicker and easier to train workers to specialize in these details.**
- **When it comes to modular, high-performance builders face the same logistical challenges that other builders do, but these can be mitigated with good management.**



Space-constrained sites, like this one in Chicago, create challenges for crane operators placing modules.



Scott Sanders

Offsite construction offers advantages to the building industry as a whole, as well as to specific niches. One niche where it can be a real problem solver is high-performance construction. The benefits of interest to high-performance builders are the basic ones that this magazine has written about extensively: superior energy efficiency, reduced material waste, more efficient use of labor, improved quality and consistency and faster build times.

So, it's good news when we hear that someone is educating high-performance builders on how those advantages address their specific needs. A recent promotion happened at the Energy & Environmental Building Alliance (EEBA) Summit in October 2024, held in Salt Lake City, Utah. We decided it was a great opportunity to talk with presenters to get their thoughts.

Scott Sanders, Principal of MOD-IMBY Consulting and Development in San Diego, Calif. and former Director of Construction for Kinexx Modular in Chicago, Ill. teamed up with Brandon Weiss, Chief Innovation Officer and Co-Founder of Dvele in La Jolla, Calif., to share high-level insights on this subject to benefit those working in the residential marketplace. The audience included developers, financiers and real estate professionals unfamiliar with offsite construction.

Drawing from their deep experience with energy-efficient, high-performance home construction, they highlighted the advantages and drawbacks of offsite and what builders need to know if they're considering making the switch to factory-built components or modules.

Efficiency, Quality, Predictability

A controlled factory environment enables crews to perfect the tasks of manufacturing wall panels, trusses, floor cassettes and volumetric modules on a repeatable timetable with consistent results. Each assembly step is standardized, which significantly cuts down on mistakes.

Sanders and Weiss emphasized that this consistency makes high-performance outcomes more



Modular homes incorporate high-quality workmanship that a factory-controlled environment makes possible.

achievable. For example, executing precise air sealing, weather tightness and energy efficiency details on the factory floor is much easier than on precarious ladders or scaffolds on an exposed jobsite. Sanders pointed out that success in building a high-performance enclosure “ultimately comes down to paying attention to such fine points.”

Weiss added that the ability for continuous quality control makes high performance possible at scale. “If you can productize a home, bring more factory-controlled quality to each work cell, and you can do the testing and validation work as you go, the chance to truly scale a high-performance product, well, that was what enticed me into the industry,” he says.

Using Lean manufacturing principles, modular construction optimizes material use and labor, creating efficiencies that aren’t possible in the field. Applying the principle of Kaizen, the Japanese method of continuous incremental improvement and measurement, helps each station crew streamline repetitive tasks, saving time and cutting down on waste. As a result, the need for rework is dramatically reduced compared to on-site construction, where site conditions and multiple different subtrade crews used from one site to another can lead to inconsistent results and schedule delays.

Modular construction shifts most labor to the factory, reducing on-site labor needs and shrinking overall project timelines. In a housing market struggling to meet

demand, factory-scaled production can deliver high-quality homes more rapidly than conventional methods.

Another vital benefit concerns training. In a factory setting, training workers to be highly skilled for their specific station tasks is easier and faster than having people go through the education, apprenticeship, journeyman, licensing and certification processes needed for skilled site trades. Weiss concluded that in the face of a skills shortage, one way to increase the production and output of quality homes is by going the offsite route.

Modular Challenges

Despite these efficiency gains, Sanders and Weiss highlighted the unique hurdles builders should be



A modern modular home nearing completion.

aware of and prepare for when considering the move from conventional to offsite construction.

Modular construction in particular demands extensive logistics and pre-planning, as well as more precise scheduling and execution than conventional stick-built methods. Transportation restrictions, street closures, special permits, noise mitigation, delays from heavy traffic and placing large cranes into tight spots challenge efforts to move bulky modules and offload them to space-constrained urban jobsites.

Delays are more difficult to work around with a modular project than with a site-built one, Sanders explained, “If module delivery gets delayed, crews and cranes sit idle, costing time and money. For a conventional build, it’s much easier to deliver materials to site with smaller vehicles, and delay-

ing a material shipment rarely stops work, as there are other tasks the crew can work on.”

Challenges can also be posed by the team structure. A modular building team tends to be structured in one of two ways. In the first model, the team is led by a general contractor (GC) who has an ongoing relationship with the module manufacturer and experience working with that manufacturer’s product. The GC coordinates the site work, installs the mechanical and electrical services and ensures that the foundation matches perfectly with the modules the manufacturer supplies. The GC also schedules the crane to offload and place modules as they arrive.

In the second approach, the project is led by an architect or designer, who tasks a manufacturer to modularize the building

design, build the modules and deliver them to the site. The GC, who is independent of the module building company, is responsible for coordinating the site work to accept these modules. This second model increases the chance of miscommunication between the module builder and the general contractor, which in turn increases the risk of mistakes when fitting the modules on-site. It can work well but needs to be carefully managed and someone has to be responsible for clear communication between all parties.

The most concerning issue with offsite, according to Sanders, is navigating the regulatory hurdles across jurisdictions. Unlike conventional builds that adapt to local building and energy codes on-site, modules built in one jurisdiction are often assembled on a jobsite with different code requirements. For example, a module factory in Chicago shipping to nearby northwest Indiana will build the modules to suit the site’s local codes. To ensure compliance, site inspectors must visit the factory, even if the build requires transporting modules only a few miles across the state line.

Another layer of complexity arises when sorting out who is responsible and liable for plumbing, electrical and mechanical work on modules built in a factory and connected on the jobsite by subtrades working to different local codes. The fragmented regulatory landscape increases complexity and often extends project timelines for modular construction projects on scattered-site builds.

Sanders and Weiss have observed that the challenges are easier to navigate with big projects — condos, hotels and other large-scale structures. “With 80 or 100 mod-



A typical interior view of a high-performance modular home awaiting final finishing touches.

ules, you deal with one architect and one jurisdiction,” Sanders said.

According to the presenters, industry-wide change will require broader adoption of standardized codes. The International Code Council (ICC), in collaboration with the Modular Building Institute (MBI), has developed standards ICC/MBI 1200-2021 and ICC/MBI 1205-2021 to address the challenges created by varying local building codes for offsite construction and compliance issues, and to support the growth of offsite construction.

The last challenge Sanders and Weiss highlighted involved financing for modular projects. Traditional lenders familiar with releasing funds incrementally as construction milestones are met may balk at the prospect of meet-

ing heavier cash demands early in the project timeline as the factory builds all modules simultaneously. Additionally, the issue of who owns, and is responsible for, offsite assets arriving on-site can impact financing considerations. “Builders who can find a bank that understands modular are in a better position to scale and save on time and costs,” Sanders noted.

Realities and Future Potential

Beyond the benefits and challenges, Sanders and Weiss advised that the feasibility of modular construction for high-performance buildings often boils down to location and project type.

Scattered-site, single-family modular home projects can face prohibitive logistics costs without a nearby module manufacturer.

The high cost of transporting bulky volumetric boxes over long distances, accommodating large trucks and cranes on the site’s terrain, and accessing suitable local contractors all factor into how effective offsite construction will be. That is, modular construction makes much more business sense for a builder in Nebraska constructing multi-story condos on flat sites with a module fabrication facility 12 miles away than for someone constructing remote vacation homes in the mountains of North Carolina.

According to Sanders, nearly 400,000 builders registered in the US construct about 65% of homes, and the top 200 production and large corporate builders build the remainder. Most low-volume builders have adopted offsite component manufacturing of roof trusses and, to a lesser extent, floor cassettes and wall panels to expedite their builds and deliver more consistent, high-quality projects.

Despite its advantages, market conditions and industry norms continue to hinder the broad adoption of modular construction. Builders must carefully assess local market conditions, regulatory requirements and logistical realities to ensure the benefits outweigh the challenges.

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All photos courtesy of Kinexx Modular.