

The Evolution of Prefabricated Housing

Though still shrouded in misconceptions, prefabricated or pre-engineered buildings have come a long way. To see just how far, *Wood Design & Building* (WDB) consulted prefabricated homebuilder **Jeff Armstrong**, M.Arch., president of DAC International Inc., of Ottawa, ON, and builder **Lowell Shay**, president and founder of Gladwyne, PA-based Shay Construction Inc.

WDB: How has prefabricated housing evolved?

Armstrong: There is a holdover perception about prefab. Prefab is almost a pejorative term – it ties back to things like trailers and low-cost mobile homes. That is often the image that’s conjured up. But the fact is, thanks to computer technology and design and its application in the construction industry, we can actually do very complicated and sophisticated buildings by breaking them down into parts so that we can prefabricate in a controlled environment and have a high degree of comfort that everything will fit together at the other end. We deconstruct very complicated buildings, build them in the factory, and then put them together on the job site.

It does come as a surprise to a lot of people – they think that in some way they are going to be compromising their building if they prefabricate it; that they’ll be limited in what they can do.

There’s an important distinction between panelized buildings and modular buildings. Panelized is what we do at DAC. With panelized buildings, the world is your oyster. You can really build anything. We haven’t encountered a building yet that we couldn’t prefabricate. Modular buildings are often large, three-dimensional boxes, and present more limitations because of



size and portability. Modular most definitely has a place in the continuum that is prefabricated houses, but what we do allows us the flexibility to build virtually anything.

WDB: As a builder, what was your perception of prefabrication?

Shay: Prefabrication is a relatively new concept for me. My background in building is actually high-end renovations. New construction was something I'd done less of, and then prefabrication was off the scale of what I would anticipate getting involved in.

I definitely thought of prefab as putting two halves together – you see them going

from what I thought of it. I'm careful of how I describe it to people, because if I say prefab they automatically get the thought that I used to have, and I wouldn't want to be associated with that. It's a funny thing – it's almost a taboo for anyone who would do high-end custom work.

WDB: How do you deal with the misconceptions around prefab?

Armstrong: We struggle because we know that prefab has negative connotations attached to it, and so in our marketing we talk about pre-engineered, that sounds more substantial, more professional.

Houses are imbued with all sorts of emotional stuff, very personal, and the notion of craftsmanship, and having craftsmen hewing your house out of a tree, is more appealing than something coming out of a factory, unless you're really embracing modern architecture. We try to pick words that avoid the negative stereotypes, but at the end of the day we're building in a controlled environment, using the right tools and dry material, and the whole process is so much more rational than a bunch of guys standing out in the rain banging things together.

WDB: Tell us about DAC, and the evolution of your business?

Armstrong: Our business is twenty years old (it was founded in 1985). DAC began life as a custom homebuilder, building on job sites in the conventional way. We were just using computers to do architectural drawings because we were a design-build firm. We were a site-based house-builder, building energy-efficient houses (we were very involved in the R2000 program right from the beginning in the '80s). Because of that experience building energy-efficient houses, we were asked to go and talk to people in Poland about building energy-efficient houses. We realized on that trip that there was an opportunity to actually export the technology. We had to figure out how to do it, but there was so much interest in what we had to say that we really scrambled for a way to capitalize on that. More than anything else that caused us to become a manufacturer. We took the skills and the experience that we developed on the job site and we brought it indoors. So our approach to prefabrication was from the perspective of a conventional house-builder. That's an important distinction – a



down the highway in trailers, or like low-income housing. I had a real low perception or a stereotypical view of it.

When I started working with DAC through Lyman Perry Architects in Philadelphia, I did a walk-through of a prefab house. My perception changed immediately. The projects are almost like they're not prefabricated but pre-organized. A lot of thought goes into it. It's completely different



lot of people who prefabricate building components come at it from a manufacturing standpoint as opposed to a house-building standpoint.

Our approach is what differentiates us. If you look at things from a manufacturing perspective, the simpler and the more repetitive the product is, the happier you are as a manufacturer. As the buildings become diverse in shape and size and complexity, it augurs against prefabrication. Because we came at it from the other direction, we figured out a methodology and a process that made doing complex buildings relatively straightforward.

We're certainly not unique in the industry, but we're at the unique end of the spectrum in terms of the kinds of projects we're willing to do. Even a conventional manufactured housing company wouldn't

take on many of the houses we've built because of their level of difficulty. We have developed an approach that really allows us to build virtually anything people can dream up.

WDB: What markets do you serve?

Armstrong: Our business is now between 80% and 90% export. The three big markets for us are the U.K., the U.S., and Japan. One of the earliest export markets for us was Japan, and we've

done a lot of work there over the last 10 or 15 years. But increasingly there are bigger opportunities for us elsewhere, like the U.K. And with the increase in profile of the environment and building energy-conscious buildings, there are more opportunities suddenly popping up for us here in Canada. So things are changing, and that's good because it makes us a better company when the people who work here can actually go to a job site and see the things that they've been working on, rather than putting it in a container and shipping it to the U.K.

WDB: Describe your typical clientele.

Armstrong: One of the things we found is that the real constituent for what we do is the architectural profession. Very often we'll get a conceptual design from an architect and we end up doing most of the working and technical drawings – we have to do those things in order to panelize the building, and many of our partner architects are very happy to give us the chore because it frees them up to do the things that they really enjoy doing. That's not always the case, but a majority



would express frustration in having to do working drawings. We seem to sit very well with the architectural profession in terms of the service we provide and the fact that we're willing to execute someone else's vision, rather than have a standard catalogue of our own designs.

WDB: Illustrate some of the interesting things you've worked on.

Armstrong: Our work in Nantucket is a perfect example of our collaboration with architects and architectural firms. The architectural firm in this case is Lyman Perry Architects – they do a lot of work on Nantucket. They became aware of us seven or eight years ago after feeling some frustration with the region's existing industry (things like availability of people, higher costs, and a smaller construction window – on certain parts of the island, you can't hammer anything on the outside of your house between the end of May and the first of September). They eventually decided it would be interesting to see if these guys up in Canada could put together these complex buildings that they were designing and deliver them to the site largely pre-built...to kind of beat the Nantucket system in a way.

The very first project we did was a house for Lyman Perry himself. They discovered they could just do the conceptual stuff, and we would do all the working drawings. That freed up a lot of his resources. Now we're working on several other projects together. The firm sends us the conceptual drawings, and we work out the structural details and produce the drawings that get submitted for approval. Then we prefabricate the building in our shop.



About three years ago I attended the opening of a \$14-million house we completed with Lyman Perry. Nobody could believe it was prefabricated – it was such a beautiful thing. In this case, we did the structure and supplied all of the exterior finishes for the building, but there was tremendous work done on the inside (cabinetry, for instance) that had nothing to do with us. But at the end of the day people had a really hard time reconciling the beauty of that building with the fact that it was a prefab.

WDB: Are they predominantly wood houses?

Armstrong: It depends. They can be anything. We do a lot of work in the U.K., and in certain regions there's very little wood cladding – most are brick-clad, or what they call render, which is stucco, or a combination of render and brick.

When you panelize a building, you can make it look like anything you want it to look like. That's helpful in export markets because in the case of the U.K. for example, there are stringent planning constraints.

WDB: What are the price points for prefab homes?

Armstrong: On the one hand, we do social housing in the U.K. Our Nantucket work – on the other hand – is at the other end of the spectrum.

Our strong suit is energy-conserving buildings – we know a lot about insulation and air-leakage control and ventilation, and all the things that you need to consider when you're concerned about energy. As such, even the social housing that we do in the U.K. is built to a very high standard of energy-efficiency. The buildings are small and simple, and not particularly finely finished, as you can imagine, but they're still very good buildings – and can be very economical to build. The people/agencies who build social housing in the U.K. generally own the buildings for decades, so a key concern is the operating cost, hence meeting a high standard of energy-efficiency.

WDB: Describe the on-site process for pre-engineered builds?

Shay: My thoughts about that have changed as I've gone along. The first house we did with DAC, we had a lot of issues with permitting and getting the approvals that we needed to build the house. In the meantime, DAC had built it and was ready to deliver it, so we had them deliver all six truckloads to the site, and it felt really daunting. How is all this stuff going to go together? How is that going to turn into what I see in the drawings? But it did, and it did really quickly.

In fact, we got started two months behind and then all of a sudden we were two months ahead. The benefit of prefabrication was clear to see – we were able to break ground in November and by December, we had a shell that we could work in through the winter. It really paid off for us.

On the second build I was able to organize the site so that we could receive the truck, put it up and then just keep the trucks going as needed. From that perspective, if you had a small site where you were cramped for space, this would also work to your advantage.

Once the house is framed up, once it's up and it's under roof, you'd have no idea it was prefabricated. Basically we just pre-cut every stick in the house, every raptor, every stud, and everything is numbered and labeled. I think the only giveaway is that the wall sections are made up of basically eight-foot-long panels – so as it goes together, you might realize it was pre-paneled. But once it's put together, it's another custom-house. And each of these houses is different.

WDB: Are there any disadvantages?

Shay: The only problem I see is that there are not a lot of people who put these together. If you go out to most frame contractors to get competitive bids, they look at it as framing a house. They don't know how to estimate it in any other way than standard framing so your pricing can be out of whack...at least until they do one and understand that it takes half as much time to put it up. 📏