



COMPETITIVE ANALYSIS

by

Dr. M. Gordon Brown, CTO

If a book were written to tell the story of housing construction in the United States, one of the chapters would be about the attempts to develop an industrialized approach that would result in dwellings that are both *low-priced and attractive*. The chapter would tell about the many attempts, especially in the post WWII era, and subsequent failures to meet those two seemingly simple objectives.

The *PanLbilt* structural insulated panel (SIP) system makes it possible to fully meet those objectives by combining multiple time-consuming processes in one simple product and system that, unlike other industrial approaches, does not determine a building's form, function and appearance. The *PanLbilt* system is virtually invisible. Like studs, insulation, subflooring, moisture barriers, fasteners, acoustic control and fire proofing materials, the *PanLbilt* SIP hides behind interior and exterior finishes.

How does the **PanLbilt** approach compare with other industrialized housing approaches? A good place to start is with Worldwide Modular (worldwidemodular.com), a Florida firm. Their approach involves building a multi-story structural frame on site and constructing in a factory individual apartment modules almost ready for occupancy, shipping them to the site and hoisting them into the frame. They say, "... think of bottles into a wine rack. Worldwide Modular has specially designed and constructed its apartment modules (the bottles) to be transported in containers by ship, truck or train to any site on the globe."

The bottles in a wine rack analogy is not a new idea. One problem is that the bottles all must be the same dimensions to fit in the rack. On the outside, they will all look alike. On the inside, there's little flexibility. And a rack is unnecessary if you have space to lay down a row of bottles on one or two shelves. A second is shipping. Since each module is about the size of an international shipping container, what is shipped is a lot of air.

A third is building height. Most attached or detached single-family dwellings are one, two or sometimes three stories. Many multi-family dwellings are three to four stories. Very few retail buildings are more than two stories. Few motels are more than two stories. Aside from tall buildings, only a small percentage of buildings in the United States have more than four stories. Those with a structural frame and elevators are likely to be much taller than four stories. A **PanLbilt** four story building does not require structural framing.

Over the past six decades, there have been many attempts to develop industrialized approaches to build housing. Why have they failed?

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One is **logistics**: they require special vehicles for delivery from factory to site. Two is **assembly**: they require mechanized technologies (and skilled operators) to move and put the product into place. Three is **user friendliness**: the end-products have limited flexibility and adaptability. Four is **market preferences**: segments that don't mind a mass-produced and utilitarian look are limited. And five is that these approaches were **never scalable**. **PanLbilt is totally scalable**.

Constructing buildings, roads, bridges, dams or anything for long term human use to sit on the face of the earth depends on weather conditions. All industrial processes, making toothbrushes, drugs or vehicles, typically take place in a controlled environment resulting in a completely finished product to be sold to the user. Except for the foundation, conventional industrialized housing construction takes place in a controlled environment resulting in a finished product (a dwelling) or modules delivered to and assembled on-site. The output product is a completed assembly of multiple sub-products.

The fallacy of conventional industrialized housing construction is that the deliverable must be a finished, usable product.

The PanLbilt approach is fundamentally different. The output product is one sub-product that replaces six sub-products and their associated construction processes. Developers and builders can use these patented structural insulated panels (SIP) to deliver their final product. Because the **PanLbilt** innovation replaces six sub-products, it can be assembled on-site so rapidly that a typical two-bedroom dwelling can be completely enclosed in one day. There's no need to build the dwelling(s) in a factory.

Enclosure makes a place habitable. Walls do the most to make a place livable. Walls change the shape of space. 2000 SF dwelling with 13 rooms including storage spaces would have about 150 linear feet of exterior and interior walls. Total wall surface area would be between 2500 to 3000 SF. As dwelling size increases, the proportion of interior walls declines. As a technology, walls have not changed much for centuries and most changes have occurred in the past 200 years. Walls have become multi- purpose technologies and will be more so in the smart house.

Exterior and interior dwelling walls today have two problems: air permeability and sound transmission. Exterior walls in most dwellings today do not have a tight fit. In winter, heat escapes and cold comes in. In summer, cold escapes and heat comes in. In both, R-values lose significance. As time goes by, walls become sieves. An important attribute of the rapidly assembled, load-bearing, interlocking fire, mold and pest resistant PanLbilt SIPs is that they fit together seamlessly and virtually eliminate air infiltration.

Without a doubt, speed is one of the most important attributes of any system today and **PanLbilt SIP** system delivers speed impressively. For example, a two-bedroom, one bath house can be completely enclosed in less than 10 hours. By reducing construction time by as much as 60 percent and construction costs by as much as 50 percent, the **PanLbilt** SIP system enables value

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adding through its inherent sustainability, lower maintenance, stylistic and functional product differentiation and, importantly, inclusion of current and future components of smart house design.

But the **PanLbilt** SIP is not only faster and cheaper, it results in significantly better dwellings that are more flexible (interior walls can be opened and moved) and more adaptable (changes can take place on-site).

A **PanLbilt** dwelling could be analogous with a new car today. The least expensive would be small, meet acceptable performance standards, have an unremarkable appearance and minimal electronic and comfort technologies. The most expensive would be large, meet high performance standards, have a distinguished or distinctive appearance, be filled with the latest electronic and comfort technologies and sell for three to four times the price of the small dwelling. There would be a level or two in-between. Nevertheless, each dwelling is built with the same advanced wall system.

Unlike most industrialized housing approaches, the **PanLbilt** system does not replace the existing approach to building houses. It makes the system simpler and more productive. Relationships in the development and construction industries and government review processes change very little.

A note on investment risk

The **PanLbilt** SIP system does a lot, but it doesn't do everything. And this differentiates it from previous industrialization attempts and minimizes market and financial risk. While the **PanLbilt** SIP system will serve conventionally financed single-story and low-rise buildings for hospitality, office, multi-family and retail markets, it will start by addressing housing, specifically affordable housing.

One of the biggest obstacles to developing innovative products like **PanLbilt** SIP system is risk to investors. From my research on and experience teaching the steps to launch a start-up and as a board member of the Colorado MIT Enterprise Forum, I am aware that governments in almost all industrialized countries have played roles in mitigating risk, sometimes by funding development, sometimes by guaranteeing and subsidizing a market.

Because governments play a major role in it, our initial market is affordable housing in Chicago. Developing affordable housing is more complex than developing normal market housing but the risks are considerably lower. We have established working relationships in Chicago with governments, unions, non-profits and community leaders that enable us to build a factory that will supply developers with **PanLbilt** SIPs.

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Within one year from completion of the first factory, we expect to supply builders with SIPs to construct at least 300 to over 1,000 dwelling units in single-family houses and apartments up to three stories. Our focus on presales aims to minimize risk. Our goal is to implement a combination of marketing and media strategies targeting organizations that develop affordable housing for rent and purchase.

The factory will function both to produce the SIPs and as a laboratory to learn how to replicate factories serving other markets and will also provide apprentice training and certification of installers.

The **PanLbilt** structural insulated panel (SIP) system begins a new chapter in the story of housing construction in the United States.

About the Author

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Consulting and research areas

- Diagnosing user and owner problems caused by improper building and spatial infrastructure
- Decision-making and judgment biases of real estate and design professionals
- Neuroscientific dimensions of building and urban form
- Pedestrian movement and premises liability
- Research methods and evidence

Publications: Dr. Brown has published many peer-reviewed and award-winning articles in architecture and real estate journals. His book, *Access, Property and American Urban Space* is forthcoming early 2016 by Routledge/Taylor & Francis. It proposes a new way to understand urban form through the relationship of real property and urban spatial patterns. It describes major changes at intervals over 200 years in the large-scale street form of American cities and shows how a regime shift occurred after WWII and its effect on economic productivity. Attention is given to property/street access patterns, property takings, design ideas, heuristics and biases issues in legal language, transaction costs and rent seeking, patterns of street development and property value anomalies. Underlying issues addressed include utopian thought in communications and transportation, the Continental Grid and Broadacre City, the Constitution and thought of Founding Fathers.

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