

BUILDER Online – May 9, 2016

The Envelope, Please!

It's time for builders to change platforms:

Part 2 – structural insulated panels

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I left off last time with a shocking comparison of construction images from 1877 and today and the observation that so little has changed... “150 years is long enough for any production method” ([Time to Change Platforms](#)). The next series of columns will examine the business case for a variety of advanced technology enclosure options. This column features one of my favorites, structural insulated panels (SIPs). It's been frustrating to watch the painfully slow market transformation process for this impressive technology that just can't get the big break.

As a quick review, SIPs are basically a sandwich panel made of foam insulation (e.g., usually expanded polystyrene and in some cases polyisocyanurate) bonded between two layers of sheathing (e.g., usually OSB panels although other options are available including magnesium board, gypsum board, and fiberglass sheets). The panels are most commonly joined with splines that form a contiguous structural assembly. Sometimes the wall panels are conveniently sized (e.g., 4' by 8', 9', or 10') so they can be handled by workers, and sometimes they can be up to 28' in length and require a crane. My frustration with slow acceptance stems from the following impressive builder benefits:

- **Superior Construction:**
 - ❖ Much faster construction time
 - ❖ Less tools for assembly
 - ❖ Reduced reliance on subcontractor work/contracts (e.g., framing, insulation, air sealing)
 - ❖ Superior moisture-managed assemblies (with basic attention to proven details)
 - ❖ Less waste
 - ❖ Full structural nailing access not limited to studs
 - ❖ Superior quality control
- **Superior Performance:**
 - ❖ Superior strength per weight
 - ❖ Superior wind resistance
 - ❖ Superior bug resistance
 - ❖ Superior quiet
 - ❖ Superior dimensional accuracy that makes everything else easier to install (e.g., drywall, trim, doors, windows, cabinets)
 - ❖ Superior energy performance with minimal thermal bridging, inherently quality controlled insulation (e.g., gaps, voids, compression, shrinkage control, settling control), and inherently air-tight assembly
- **Superior Unvented Attics** (where used for roofs):
 - ❖ Hard cost savings for soffit and ridge vents
 - ❖ Fire-rated assembly difficult to achieve with other unvented attic insulation options
 - ❖ Elimination of all thermal bypass details requirements:
 - Wind baffles
 - Air sealing where drywall meets top plate at all walls adjoining attic
 - Insulated and sealed attic hatches and knee-wall doors
 - Sealed air barrier at raised and dropped ceilings
 - Sealed air barrier at attic knee walls
 - Sealed penetrations (e.g., lighting fixtures, piping)
 - Flashed and sealed shafts (e.g., ducts, flue, piping)
 - Air sealing at all HVAC register boots
 - ICAT recessed light fixtures
 - ❖ Free storage in conditioned attic space
 - ❖ Adaptability to much lower cost shallow frost-protected footings rather than basements in cold climates since basement no longer needed for storage and HVAC system
 - ❖ Savings from forgoing split HVAC in two-story homes since second floor no longer adjoins egregious hot temperatures in summer

Okay, I get it; SIPs is an entirely different enclosure paradigm and builders don't like change. As a result, builder cost calculations too often don't recognize the significant savings from the benefits listed above not to mention what should be much more satisfied homebuyers. But I remain hopeful because there are builders that have made the commitment to get past the learning curve and internalize all of the benefits of SIPs. One my favorites is a good friend, Steve Brown of Carl Franklin Homes. He's passionate about SIPs because he gets it and has learned how to construct SIP homes at the same or lower price as stick frame competitors. Steve begins by using four-foot wide panels for the walls because they are easy to handle by his trained workers in the field and more forgiving of small foundation variations (see Figure 1 below). He'll then use cranes to set the larger roof panels (see Figure 2 below). Specializing in workforce housing, his designs easily accommodate optimized dimensions for SIPs (e.g., 4' for floor plan and 2' roof panel length) along with standard 3050 sized windows. He only uses inverter driven heat pumps, but saves money on much smaller size equipment such as ductless mini-split systems. And lastly, he has taken the time to train his electric subcontractors so they can now wire homes at the same or lower cost to conventional framing. Now Steve is considering setting up his own SIP plant; there's no going back to sticks for him.

For those not willing to go full bore like Carl Franklin Homes, let me suggest the 'killer app' SIP package as a way to get your feet wet with this technology innovation. It's simply better business solution to use SIPs for the following details:

- **Band Joists:** SIPs eliminate one of the most difficult and costly insulation details in homes while also eliminating the need for window and door headers for additional savings.
- **Attic Hatches:** SIPs are substantially more effective and persistent insulating this large hole to the attic including enough weight to ensure a tight gasket connection.
- **Attic Knee Walls:** SIPs provide one of the simplest solutions to a difficult construction detail including insulation, air barrier, and required fire protection.
- **Floors Above Garages:** Using SIP floor panels for conditioned rooms (e.g., bedrooms, bonus room) above garages eliminates another one of the most costly and difficult insulation details in housing and helps eliminate one of the most prevalent homeowner comfort complaints.
- **Roofs:** SIP roofs provide unvented, conditioned attics with all of the impressive benefits listed above.

To be clear, I am not associated with or financially linked to any SIP manufacturer or association. I'm simply a long-time industry observer asking hard questions why this technology is so slow to be embraced when it offers to many solutions and benefits to the housing industry. And I'm good with it being too expensive, but only if it gets full consideration for its benefits.



Figure 1: Carl Franklin Homes constructing walls with 4' SIP wall panels.



Figure 2: Carl Franklin Homes constructing roofs with crane set SIP panels.

*This article is part of a series on housing innovation based on the author's book, **'Retooling the U.S. Housing Industry: How It Got Here, Why It's Broken, and How to Fix It.'** This book examines opportunities to transform the homebuyer experience relative to five key components: 1) Sustainable Development, 2) Good Design, 3) High-Performance, 4) Quality Construction, and 5) Effective Sales. Each article features one innovation or business principle covered in workshops with builder executives. Find out how to participate in one of these workshops at www.SamRashkin.com.*