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It's Time for Builders to Change Platforms: Part 4 – Engineered Precast Concrete Walls

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Those readers following this monthly column know that the last four months have been dedicated to solutions for breaking the virtual 150+-year gap in significant wall framing innovation (see [Time to Change Platforms](#)). To wrap up this series, I decided to take a hard look at a compelling option most commonly used for basements, but also well-suited for above grade walls, engineered precast concrete walls. With this technology, off-site production facilities pour concrete into forms configured to detailed construction plans. One of the most popular manufacturers for residential construction is Superior Wall®. Their forms result in a concrete wall configuration that includes a thin profile top bond beam, less than 2" thick exterior skin, and ribs two feet on center (see Figure 1). Either 1" (R-5) or 2.5" (R 12.5) extruded polystyrene rigid insulation is bonded to the panels between the ribs, and the top bond beam and ribs are faced with 1" of expanded polystyrene. Thus, the system effectively includes a complete thermal break. Additional insulation can be installed in the space between the ribs for a higher R-value where desired. The front edge of the expanded polystyrene ribs are faced with galvanized metal studs for directly installing a finished wall and the ribs are pre-drilled for wiring and plumbing. The total wall thickness is 10 ¼". The completed wall panels are installed in the field with cranes directly on a gravel bed without the need for a footing. Once installed, the panels are effectively bonded together for greater strength than a conventional concrete foundation even though the system is so resource efficient it can use up to 75 percent less concrete than a conventional foundation. A typical precast foundation can be installed in one day (see Figure 2).

As discussed last week, concrete represents a complete platform change from traditional wood framing. This is significant because wood as a construction material burns incredibly easily, rots when wet, is food for insects, has poor dimensional stability, offers minimal impact resistance, and provides no thermal storage capacity. In contrast, recall that concrete is noncombustible, moisture resistance, insect resistant, dimensionally stable, impact resistant, and has excellent thermal storage capabilities. One key challenge with precast wall systems is that the sitework trades must be skilled and held accountable for perfectly level grades. There is no forgiveness with this system. But, consider the following impressive benefits:

- **Superior Construction:**
 - ❖ Much faster construction time
 - ❖ Less tools for assembly
 - ❖ Substantially reduced subcontractor work (e.g., integrated framing, chases, insulation, air sealing)
 - ❖ Substantially less waste
 - ❖ Superior dimensional accuracy helps ensure better quality fit, finish, and trim
 - ❖ Smaller heating and cooling systems due to substantially reduced loads and outstanding control of mean radiant temperatures
 - ❖ Year-round construction since precast concrete can be installed in cold weather

- **Superior Performance:**
 - ❖ Superior strength (effective bond beam results in added strength)
 - ❖ Superior disaster resistance:
 - Impact resistance
 - Water resistance
 - Wind resistance
 - Fire resistance
 - ❖ Superior moisture protection (5,000 psi precast concrete is nearly water-proof compared to more porous 2,500 psi concrete used in conventional foundations)
 - ❖ Superior drainage (the absence of a footing provides a clear path for sub-slab moisture to the foundation drain)
 - ❖ Superior quiet
 - ❖ Superior energy performance
 - Minimal thermal bridging
 - Superior insulation installation quality (e.g., no gaps, voids, compression)
 - Inherently air-tight assembly
 - ❖ Superior moisture storage to buffer the home from moisture related issues
 - ❖ Superior resource efficiency requiring substantially less concrete for foundation
 - ❖ Substantial space savings (finished basements with conventional foundations also need a framed assembly and air space that can add approximately 6 inches around the perimeter consuming about 80 square feet of space in a 1,500 square foot plan).

I would be interested in the possibility of using precast panels also for the slab with the flat exterior skin facing the ground (see Figure 3). I understand this would have to be engineered for necessary lateral support, but this innovation would add impressive additional benefits. First, it would eliminate virtually all limitations for winter construction by allowing all foundation work, walls and floor, to be installed in cold temperatures. Second, it would eliminate the complications and labor installing rigid insulation under the slab. And most importantly, it would result in a diaphragm floor in the basement where a typical OSB or other sheathing was fastened to the metal studs covering the ribs. This would enable the basement to feel just like an above-grade floor. In other words, you would be truly building lower-levels

rather than basements. And the gap between the subfloor and rigid insulation could be used as valuable space for wiring and plumbing.

Yet again, this alternative technology offers an impressive list of advantages similar to those cited in previous articles. But they are important to highlight to ensure full accounting of all cost debits and credits with new platforms like engineered precast concrete walls, especially since they usually entail a higher 'sticker price'. And like the other options, this includes substantial relief from what is so often cited as the biggest challenge for home builders: finding reliable, skilled, and affordable trade partners. It should be noted that this technology has been around a very long time including over 35 years for Superior Wall. Yet the market share remains extremely low.

However, there may be cracks in the resistance. As one example, a builder who attended the Retooling the U.S. Housing Industry workshop, Kiere DeGrandchamp, president of High Performance Homes, was convinced to give this technology a try. He switched in the middle of development to the precast concrete foundation for his homes at The Links at Gettysburg in Gettysburg, PA. When I discussed his experience following his initial installation, he admitted there were some bumps getting past a few learning curve issues the first time out, especially since the project entailed a relatively complex design and site (see Figure 4). However, he loved the substantially improved results and knows the next time will be significantly easier. He is not turning back. It's great to find builders open to innovation.

Again, I am not associated with or financially linked to any product, technology, builder, or manufacturer. I'm simply a long-time industry observer asking hard questions why so many compelling new technology solutions are so slow to be embraced when they offer so many solutions and benefits to the housing industry. This is the last technology I'll feature on platform changes for wall technology. If you are using an innovative wall system, whether any of the ones covered in this series or others, please share your experiences with me. I'd love to share them with this column's readers.



Figure 1: Superior Wall Engineered Precast Concrete Wall



Figure 2: Precast Concrete Foundations Installed in a Day with Cranes

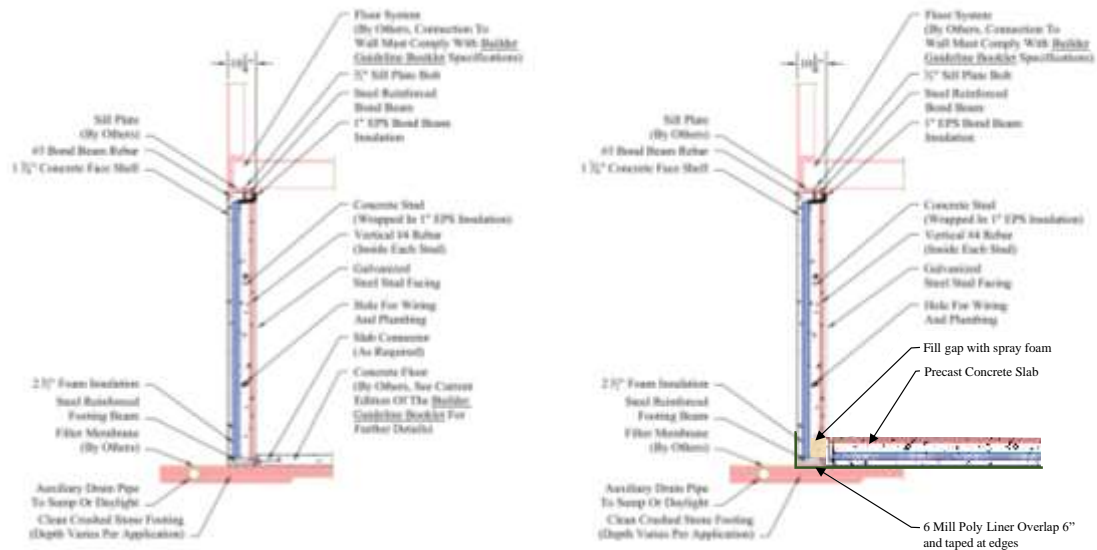


Figure 3: Typical vs. Hypothetical Precast Foundation Wall Section Using Panels for the Slab



Figure 4: High Performance Homes Precast Concrete Foundation

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.