Steel Structural Insulated Panels: *Hybrid Combines the Strength of Steel with the Speed of SIPs*

Builder's Experience

EASE OF INSTALLATION
DIFFICULT — EASY

SPEED OF CONSTRUCTION
SLOWER — FASTER

COST EFFECTIVENESS
POOR — EXCELLENT

RETURN ON INVESTMENT
IMMEDIATE — DEFERRED

COMPETITIVE EDGE
NONE — SIGNIFICANT

HOMEOWNER INTEREST
LOW — HIGH

Challenges: Convincing clients that by using SIP construction, I can deliver a more durable and comfortable home weeks before other builders.

Would he do it again? Yes

PATH Attributes:

- Energy Efficiency
- Quality and Durability
- Safety and Disaster Mitigation

Builder Tips: "Make sure your supplier has structural engineering documentation that will satisfy building department officials."

Builder:
Fred Ballard
Blue Horse Building & Design
Austin, Texas

Builder Type:
Small Custom Homebuilder

The Technology:
Panelized Wall and Roof Systems with Structural Insulated Panels (SIPs)

The Project:
The exterior walls and roof of this large custom home west of Austin, Texas are constructed of steel SIPs.

"Using steel SIPs can knock 3 to 5 weeks off your framing and insulation schedule."

– Fred Ballard

BALLARD'S STORY

Fred Ballard is a second-generation carpenter who became interested in better methods of construction while traveling abroad for an international company. When he discovered steel SIPs, he was intrigued with the idea of combining the strength of steel-engineered walls with the speed and insulating advantages of panelized construction.

"It struck me that if we used panelized building products, our homes could be built much faster, without sacrificing strength or quality," says Ballard. "With pre-manufactured steel SIPs, you also don't have to worry about warped walls, mold issues, or termites."

"The first home we built with SIPs had a 20-foot top plate. After a few hours of connecting panels, it was amazing how consistent and absolutely straight the walls were. Even better, they can knock 3 to 5 weeks off the framing and insulation stage of construction."

"Steel SIPs are also able to withstand extreme weather conditions during construction.

This house was designed with the latest in steel SIP technology to make the construction process as appealing as the home itself.

They're waterproof, which means we build more houses since our construction schedule is less dependent on the seasons. Our homes are engineered to withstand hurricane-force winds, making them safer as well."

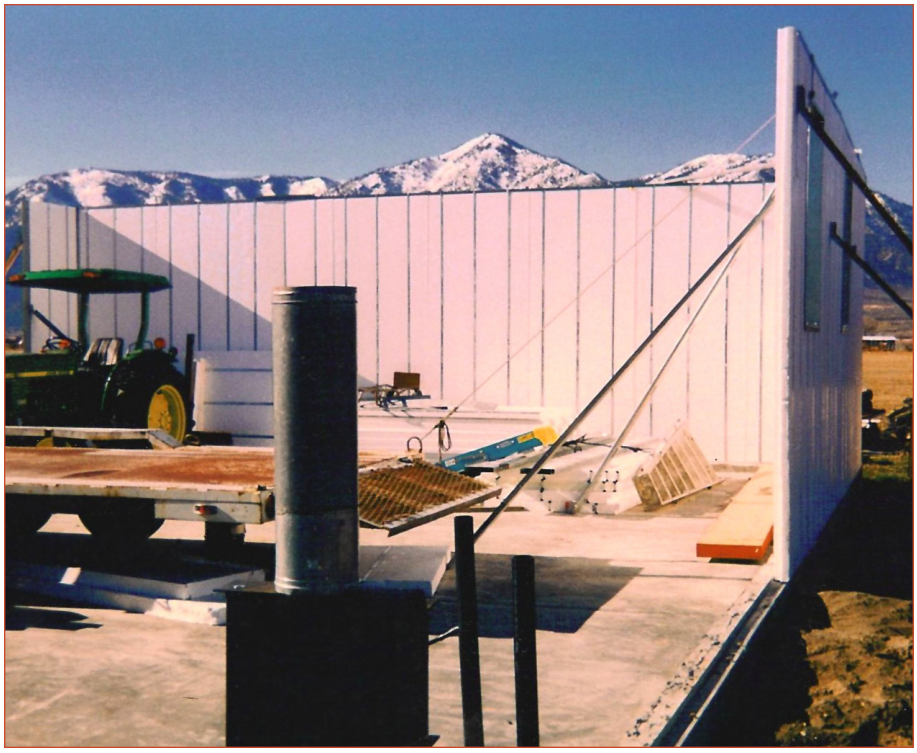
"Using steel SIPs has made us more competitive because people realize they are getting a better house. We pride ourselves on continual innovation, and using metal SIPs has only enhanced our business. The speed of construction and quality of our building envelopes is hard to beat using any other building method. Clients respect the fact that we strive to place more of their investment dollars into superior materials that streamline the construction process and get them into their homes faster."

COSTS OFFSET BY EFFICIENCY

"We are set on building homes with good thermal building envelopes, indoor air quality, water quality, and natural light to improve the quality of living for the clients we build for. The attributes of steel

Blue Horse Building & Design was established in 1992 by Fred Ballard and Jake Bradley, design/build contractors specializing in residential, multi-family and light commercial projects. Blue Horse builds about five homes a year, ranging in price from $650,000 to $1.4 million, and has built over 20 homes using steel SIPs since 2001.

Why Ballard builds with steel SIPs:
"It's almost like building with Legos—it's truly that easy."



Steel SIP walls are placed into their bottom track, braced, and then fastened in place after installing the top track.

SIPs include the tightness of construction, improved indoor air quality, and superior thermal properties. This all combines to create a healthier, more efficient, and more affordable home."

"Steel SIPs add between 5 to 10 percent to the overall cost of construction, so we try to determine in advance whether the budget is the client's primary consideration. If our clients plan to live in a home for more than five years, then the increased cost can be offset by monthly energy savings of 30 to 50 percent. The investment in steel SIP construction is usually recouped within ten years."

"Convincing people that their home could be built faster and better with insulated steel panels can be tricky at first, but once they walk into a SIP-framed home, they are sold. Our homeowners have been known to brag about how stable the indoor temperatures are compared to outside."

MATERIALS

Steel SIPs can be used for floors, interior and exterior walls, ceilings, and roofs.

Manufacturers of steel SIPs usually produce specific widths, so designing with modular increments corresponding to stock panel widths is recommended. Stock panels are typically 4 feet wide and range from 8 to 12 feet high. Even if panels are cut to fit one wall, the remaining portion can usually be used in another location to minimize waste.

"The TransconSteel UltraFrame panels we use are made with Delta Studs, a patented lightweight steel framing system with the same geometric profile as conventional steel stud C-channels. A moisture-cured adhesive is then used to glue expanded polystyrene (EPS) foam between the Delta Studs. The EPS foam has a fire retardant built into its cellular structure and also includes a Borate treatment to keep pests from nesting in the walls."

"TransconSteel panels come in thicknesses of 3½" and 5½" with light gauge (24 ga.) Delta Studs at either 16" or 24" on center. We use both 3½ and 5½ inch thick panels, but lean more towards the 5½ inch thick panels to create a more satisfying-looking wall with deeper window jambs and increased sound attenuation."

"We prefer SIPs with pre-cut openings, which include headers and require accurate door and window measurements to minimize cut-out waste. The alternative is to field cut openings and deal with the extra waste. Even with precut panels, unforeseen plan changes are accommodated fairly easily. There's nothing that can happen in the field that's unfixable."

"When building with steel SIPs, the one thing you can't do is go to a typical home improvement store to purchase anything you might be short of. For example, if you find yourself in need of an additional panel, it could cause a significant construction delay, depending on the location and responsiveness of your supplier. We sometimes order a few extra panels just for backup."

HOW IT WORKS

SIPs are made from a thick layer of polystyrene or polyurethane foam sandwiched between two layers of oriented strand board,plywood, light gauge steel studs or fiber cement. The result is an engineered panel that provides structural framing, insulation, and exterior sheathing in a solid, one-piece component. Arriving precut to the jobsite, the panels can be rapidly assembled by workers without extensive training. SIPs construction allows builders to quickly construct an exterior building envelope that is strong, airtight, and energy efficient.

Read the ToolBase Tech Spec.

INSTALLATION AND TRAINING

"Steel SIPs are also lightweight and easy to handle. Most panels weigh between 30 and 80 pounds, depending on the size, requiring only 2 men to position them. We like to have 3 to 5 crew members on site to install the panels. As long as your crew knows square, level, and plumb, they can install the panels just fine. A typical house, around 2,000 square feet, takes about 3 to 4 days to get the SIP walls and roof up."

"As with any home, but even more so when using SIPs, it's really important to make sure that the slab is formed and poured properly to ensure straight edges and a level finished surface. We measure the slab, lay the bottom track out, much the same way we would lay out a bottom plate for a wood-framed wall, and then use anchor bolts to attach the track to the slab shortly after the concrete has set up. I like to hang the track off the slab ½" to create a drip ledge even though we also seal underneath the track. Once the bottom track is set in place, we start at a building corner and set two corner panels into the track, joining them with a sealing caulk adhesive before fastening them together. It's almost like building with Legos—it's truly that easy."

EFFECT ON THE TRADES

"The electrician, plumber, and roofer are all affected by our use of SIPs, but training usually just involves a brief explanation of how their respective jobs will be handled in order to hit the ground running."

"Most SIPs have chases already pre-made for electrical and plumbing. Some SIPs require furring with a 5-gauge hat-channel (16" on center) to run piping for stacks or drain lines. We typically run lateral electrical, plumbing, and other lines and leave a 12" gap above the finished floor to match the wirechase height on the panels. Another way to run floor-level lines on walls without a chase is behind hollow baseboard trim and around door casing. We are still perfecting our technique for concealing the lines to the overhead lighting from the switch."

"On interior wall surfaces, standard gypsum board can be attached directly to panels containing electrical and plumbing chases. Otherwise, drywall is attached

Most panel sizes are conducive for easy transportation. Panels are also labeled according to their placement to speed installation.

TECHNOLOGY HIGHLIGHTS

This project included the following PATH-profiled technologies:

- High Performance Glazing
- Panelized Wall and Roof Systems
- Rainwater Harvesting
- Solar Water Heating
- Structural Insulated Panels (SIPs)

to the hat channels on furred walls and finished with conventional tape and mud. We frame interior partition walls conventionally with either finger-jointed wood studs or light gauge steel and insulated with either fiberglass batts or spray-applied foam. For fireplaces and chimney shafts, we use Isokern® systems that are modular masonry units made from volcanic pumice that can be installed in under a day."

"The most common exterior finish we use is conventional cementitious stucco over building paper and lath secured with Tek® screws. The project includes a stone veneer wainscot with conventional stucco above. Depending on the panel coating, synthetic stucco is another exterior finish possibility."

WORKING WITH THE INSPECTOR, MANUFACTURER, AND SUPPLIER

"We sometimes get strange looks when submitting plans showing steel SIP construction. During the permit process, we combine product testing information and project-specific design calculations to obtain approval from building department officials. Usually a structural engineer evaluates the project design and signs off on its structural efficacy. Since many building inspectors are unfamiliar with the panels, we have had to produce span charts to prove the product's structural capabilities. Even after our sixth project involving steel SIPs, we are still educating the inspectors about the advantages. The irony is that steel SIPs are actually stronger than many other building methods."

"When choosing between different steel SIP systems, pick a manufacturing company that has engineering capabilities and can provide personal consultation and training during your first installation. It is crucial for the SIPs manufacturer to be able to provide panels for a building with the back-up engineering for building departments, building inspectors, architects and structural engineers who are not familiar with SIPs construction."

"The way SIPs integrate with other building materials is another important consideration. Connection details involving the slab, roof panel, and exterior siding need to be clear and well planned out since every building component relates to another. You want a supplier of steel SIPs who has thought about these things."

"Well-documented engineering and information outlining the properties and qualities associated with steel SIPs is essential, but sometimes difficult to obtain. As a builder, you need documentation that will satisfy the structural and insulating requirements that building department officials are concerned with. We spend a lot of time working with building inspectors. Better documentation from manufacturers would make that easier."

SCHEDULING, STORAGE, AND TRANSPORTATION

"When using our local supplier, we allow about a 2–3 week lead time. If we were to use an out-of-state supplier, I would figure more like 2 months to avoid having a framing crew ready and waiting on panels."

"Panels arrive to the jobsite by truck and are numbered, which helps crews place them around the slab according to the order in which they are installed. Trucking and freight costs can range from $500 to $2,500, depending on the distance they are being shipped. A typical 2,500-square-foot home can be delivered using one truck, but if you're not ordering full truckloads, freight cost per square foot will tend to be higher."

The Partnership for Advancing Technology in Housing (PATH) brings together builders, manufacturers, researchers, government agencies, and other members of the housing industry. PATH partners work to improve the quality and affordability of new and existing homes. The program is administered by the U.S. Department of Housing and Urban Development's Office of Policy Development and Research.

To learn more about PATH, visit www.pathnet.org. To learn more about PATH-profiled technologies, visit www.toolbase.org/techinv.

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