

BUILDING ENVELOPE

Structural Insulated Panels

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All Together Now: SIPs Offer a More Efficient Envelope

If you have ever met an ultralight backpacker, you know they are fanatical about reducing the weight they need to carry. They select items that do double duty, such as using a drinking mug as a cook pot or a jacket as a pillow.

For the building envelope, this strategy can help speed construction and create a higher-performance system. For example, structural insulated panels (SIPs) fulfill several functions in one product, and can serve as structure, insulation, and air barrier. Building with SIPs eliminates the need for separate schedules and crews for framing the building, installing insulation and completing the air barrier. In a commercial or institutional building, this can shave weeks off the construction schedule.

A case in point is the 900-student Jacob E. Manch Elementary School in Las Vegas, Nev. By shifting from concrete masonry units (CMUs) to SIPs, the project team was able to reduce the framing schedule from the 17 weeks allocated by the school district to only 7 weeks (a 60% time savings).

For the 35,000 sq. ft. Little Bighorn College Health and Wellness Center in Montana, "using SIPs probably saved about 15% to 20% or better on the installation time," said contractor Glen Kamerman. "With the pre-built panels, you just need to piece the building together like a puzzle."

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Staying Ahead of Schedule

In addition to allowing for construction of the structure, insulation and air barrier in one step, SIPs can help speed construction in several other ways:

- Window and door openings are already cut out, eliminating the need for separate detailed framing and header installation.
- Engineered panels are flat, so drywall, cabinetry, door and window installers complete their work faster with a better final finish.
- SIPs' oriented strand board (OSB) sheathing provides a continuous attachment point, so crews do not need to search for studs when installing cabinetry.
- SIPs come with pre-cut electrical chases eliminating the need to drill holes for wiring through dozens of studs.



SIP construction has far fewer gaps than other framing methods.



Designers can incorporate SIPs in any architectural style, as seen in this Washington state winery.

Energy Performance

Faster construction is a clear benefit for many projects, but how well the finished envelope performs is crucial. Here, SIPs also offer advantages over other building methods. SIPs provide a more energy-efficient building envelope in several ways. Because they come in large sizes (wall and roof panels up to 8 ft. x 24 ft.), SIPs have fewer gaps between structural components than other framing methods, thereby reducing air leaks. The U.S. Dept. of Energy found that SIP-built enclosures are about 15% [Click to close](#) more energy-efficient than wood-framed construction.

SIPs also provide continuous insulation across each panel's height, width and depth, which helps eliminate thermal bridging. Finally, SIPs prevent convective looping. In a typical insulated wall cavity, small spaces between the insulation and framing allow warm air to circulate, which wastes energy; SIP walls do not have these spaces.

Ensuring High Performance

To get the most benefit from SIPs and ensure long-term durability of the wood sheathing, it is important to take steps to manage air and moisture movement.

Sealing joints between individual SIPs and between panels and other parts of the structure is straightforward and

simple. Methods include mastic, expanding foam and SIP tape. It is important to confirm with the SIP manufacturer which sealing material types and methods they recommend for a given panel application, and to check local codes for regional or project-specific requirements. Here are a few more details about each method:

Mastic: Sealing against air and vapor migration in SIP construction requires mastic between all foam-to-foam, wood-to-foam, and wood-to-wood interfaces. Polymeric mastics are often a good choice, since they remain flexible in a range of temperature and humidity conditions.

Expanding foam: To fill voids between SIP panels and between panels and other parts of the structure, high expanding foam sealant is an effective choice. Areas to note are between wall assemblies and sloped roofs, at the roof ridge line, around recessed switch and outlet boxes, and hollows created for anchoring wall SIPs to the foundation.

SIP tape: Typically, panel installation details call for 6-, 12-, or 18-in. wide SIP tape, depending on location. In certain climates and based on local codes, an additional vapor retarder may be necessary (such as polyethylene sheeting.) In today's high-performance buildings, the envelop must act as a well-integrated system. SIPs provide a fast, energy-efficient construction method for buildings of all types. □