



STRUCTURAL INSULATED PANELS

DISCOVERING THE "STRUCTURE" IN SIPs

By Michael F. Jasmin

"Structural panels - I've seen those before, I'm just not sure how to engineer them." I have heard this a lot from engineers, architects and builders. It's true that a lot of the technical design information that individual SIP manufacturers have developed is proprietary and not widely disseminated, but WAIT, there's hope. Even as you read this article, industry engineers and design professionals throughout the private sector, maybe even someone you know, are working diligently to end this situation. Better than that, progress is being made.

SIP's 101

SIPs are made of a layer of foam, either Expanded Polystyrene (EPS) or Polyurethane sandwiched between two pieces of Oriented Strand Board (OSB) and occasionally plywood. EPS panels are laminated and can be as large as 8- x 24-feet. Polyurethane panels are manufactured by injecting foam between the OSB face panels and are limited to 4-foot widths. Typically, the foam is the thickness of nominal 2x lumber for connection detailing. Common panel dimensions are 6 ½-inches thick for walls, and 8 ¼-inches thick for roofs. Panels are also available in 4 ½-, 10 ¼- and 12 ¼-inch thickness. Many companies go a step farther and offer a pre-applied finish material to one side, such as V-groove pine or gypsum wallboard.

A Brief History

Structural Insulated Panels, once called Stress Skin Panels, have been around for over 50 years. From their humble beginnings as modest residential structures in the suburbs of Michigan to some of today's most technologically correct structures, this building material has come a long way.

In the early 80's, timber frame structures and their post and beam cousins were finding their way back into residential construction. There was a demand for a quick and efficient enclosure system that would alleviate the perception of the need to "building it twice" that a stick frame wall built over a timber frame would perpetuate. SIP's were the natural solution for enclosing timber frame structures.

Not long after that, some manufacturers started experimenting with their panels as stand alone structural systems, replacing the studs, rafters, insulation, and sheathing in residential structures with a single material.

Now several companies are code listed and some others have third party testing records. SIPs have been approved for all seismic zones, and are approved for almost every jurisdiction in North America.

Most panel companies offer "pre-cut" panels. SIP's are completely fabricated in accordance with approved shop drawings. Panels are cut to width and length with window openings, door openings, prepared corners, eaves, rakes, ridges, beam pockets, panel splines or other required details. Each panel is labeled for assembly. Pre-cut panels also allow the builder to more accurately adhere to tight schedules, and virtually eliminate site mess. This is a significant leap forward from the site cut days of just 10 years ago.

SIPs are no longer limited to residential structures. Commercial buildings are the fastest growing segment of the SIP market. There are a number of reasons why panels are becoming popular for commercial structures.

- Schedule - SIPs can be erected faster than conventional stick frame construction.
- Prefabrication - SIP's are fabricated in a shop under controlled conditions.
- Size - big doesn't intimidate commercial contractors. Panels can be obtained as large as 8- x 24-feet, requiring fewer pieces. Cranes and fork trucks needed for handling and erection are common to commercial construction.
- HVAC Efficiency – costs can be saved in the HVAC systems due to the energy performance of SIP's.

SIPs are Green

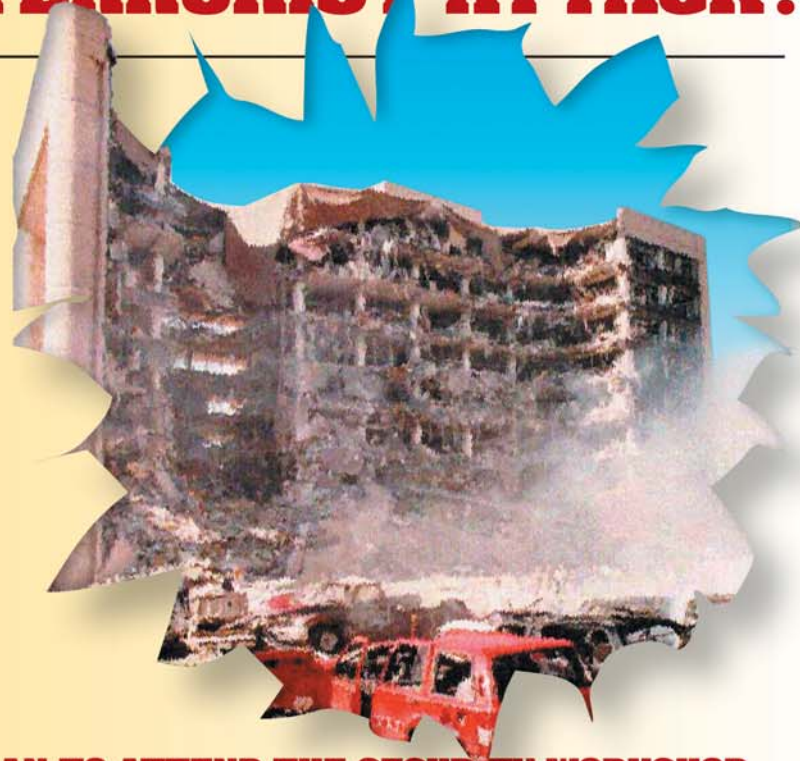
Few building systems are as energy efficient as an SIP structure. Panels result in a "tighter" structure with a very low air infiltration rate. The lack of studs, rafters, and the like eliminate thermal bridging, resulting in a uniform insulation rating in walls and roofs. The joints between panels are typically filled with urethane foam during erection to prevent any infiltration at the seams.

Far less lumber is consumed in an SIP structure than in conventional wood frame construction, conserving forest resources. OSB is typically derived from sustainable managed forests. EPS is made from petroleum by products that were previously discarded.

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WILL YOUR STRUCTURAL DESIGN WITHSTAND A TERRORIST ATTACK?



PLAN TO ATTEND THE SECURITY WORKSHOP ON DESIGN TO RESIST EXPLOSIVE EFFECTS

The workshop will review the new Unified Facility Criteria (UFC) 4-023-02 scheduled to go into effect this spring and cover the evaluation of the ability of existing, conventionally-constructed walls, columns and roofs to resist airblast effects and provide guidance on various retrofit approaches. The workshop will provide civil engineers, security professionals, and other design professionals responsible for designing, specifying, or constructing blast upgrades for Department of Defense facilities, a better understanding of what can be done to building systems to protect their occupants from terrorist bomb attacks.

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Structural Performance:

Individual SIP manufacturers publish span and load tables for their products. There is some variation in the published structural properties between manufacturers, even though the panels are almost indistinguishable. When an application exceeds the span tables, LVLs can be inserted into the joints between panels to increase the panel's load capacity.

When used over a timber frame structure, the ability of panels to span several feet versus inches allows for wider spacing between timbers.

SIP's are particularly rigid diaphragms and shearwalls. Unfortunately, most manufacturers do not publish shear values. Conservatively, APA published values for a single thickness of OSB can be used. ■



For more information on Structural Insulated Panels contact the Structural Insulated Panel Association (SIPA) at www.sips.org. This non-profit organization is dedicated to educating the public and the professional about the benefits of SIP construction. The web site contains reference material, timely articles and non-proprietary informational literature.

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