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Reducing Health Care Cost Using Structural Panels...

Healthcare facility designs have advanced dramatically in recent years, resulting in more aesthetic and comforting environments, **yet the underlying structural systems have remained much the same for decades.** To improve energy efficiency and indoor air quality, lower interior noise, reduce building cycle times, and cut-down on construction waste, **design professionals are looking more closely at the building envelope. Structural Insulated Panels (SIPs) are one advanced building technique many are now using to meet these needs.**



Hospital administrators are dealing with a myriad of changes and uncertainties from healthcare reform to worker cutbacks to liability concerns. Designing and constructing higher performance buildings is one way to help them meet the growing pressures of a difficult industry. On the facility design and operations front, finding ways to reduce building and operating costs, while still ensuring quality, is especially critical. (SIPs) are one advanced building technique many are now using to meet these needs in community hospitals, private clinics, long-term care facilities, and other low-rise

healthcare buildings.

SIPs background

Structural insulated panels provide many benefits compared to other light commercial construction options such as stick-built framing, concrete masonry units (CMUs), and tilt-up concrete. They are engineered components composed of two outer sheathing layers, or “skins,” laminated to a rigid insulating foam core. These structural units take the place of individual wall studs and floor or roof joists, as well as blown-in or fiberglass batt insulation.

SIPs are extremely strong, and in most conventional applications are structurally self-sufficient. Designers now use SIPs to take care of high loads (including those from gravity, snow, high winds, and seismic forces) in walls, roofs, and floor applications.

Design professionals can incorporate SIPs into typical exterior walls, as well as shear walls to resist earthquakes and high winds. Extensive testing has proven that SIPs work well in high-risk earthquake areas, including seismic design categories **D, E, and F**.

Available in sizes up to 8' × 24', SIPs allow for straight and ‘true’ walls. In roofs, the panels can be used without an engineered truss system and can span long distances—up to 20 feet based on design parameters. As a result, they can help create open interior spaces by reducing the need for intermediate structural supports. *In a healthcare setting this provides room for persons with assistive devices or limited mobility or vision to move around safely with less navigation obstacles.*

Given their strength, SIPs are approved in both single- and multistory, low-rise buildings. SIPs are approved for ALL Type V construction (typically four stories). SIPs have achieved UL fire ratings and listings. Because the SIPs utilize a solid rigid insulation core, the propagation of fire within the wall cavity is greatly limited both because the insulation has a Fire Retardant within the material(s) and, the absence of ‘gaps’ in the wall, limit the ability of oxygen to add fuel to the fire.

Superior insulating properties

The SIPs’ solid foam core greatly reduces air movement within walls. Since there are no studs within cavity, SIPs have fewer thermal bridges than stick-built framing. As such, SIPs dramatically improve energy efficiency, help improve indoor air quality, and reduce outside noise.

A study by the Department of Energy’s (DOE) Oak Ridge National Laboratory (ORNL) found that SIPs construction is 15 times better at stopping air infiltration than standard wood framing.

The lab also evaluated the whole-wall R-values of structural insulated panels versus stick framing. Their tests accounted for energy loss through the structural members, corners, joints, and around windows. Such assessment provides a more complete picture of the insulating capacity of a wall assembly, beyond just the insulation’s R-value. **They found that a 3.5-inch thick core SIP had a whole-wall R-value of 14.09. In contrast, a wall framed with 2" × 4" studs at 16" on center spacing had a whole-wall R-value of 9.58. Therefore, the SIP wall had a 47% higher whole wall R-value.**

The reduction of air infiltration that SIPs provide allows the installation of smaller HVAC systems, annual energy savings of up to 50-60%, and more efficient temperature control than conventional construction. Beyond cost savings, these factors play an important role in building health and building operating cost mitigation.

Hospital-acquired infections (HAIs) continue to be a concern for administrators. Based on estimates from the Centers for Disease Control and Prevention (CDC), HAIs affect nearly two million acute care patients a year. Better air quality from tight SIPs construction may improve patient outcomes by helping prevent these infections since the microorganisms depend on humidity and temperature to survive. **The tightness of the SIPs envelope also makes buildings less prone to infiltration by common pollutants such as radon, molds, pollen, volatile organic compounds (VOCs), and lead dust.** Because a well-controlled indoor environment is healthier and more comfortable—two important qualities in a healthcare facility—SIPs can be an integral part of the overall air management plan.



Another benefit of effective insulation is the amount of noise reduction it offers. Healthcare facilities consider this in regards to patient health, comfort, safety, and effective communication (staff-to-staff as well as staff-to-patient). Because the most frequently prescribed treatment option throughout history has been rest and sleep, the need for noise reduction is clear, especially for inpatient treatment or long-term care facilities. Planners, architects, designers, engineers, and builders are challenged to address noise and privacy concerns as evidence from the Pebble Project (1984 study by Dr. Roger Ulrich) showed the impact of design on the treatment outcomes and the well being of patients and staff. Because SIPs are effective at blocking high-frequency noise, they can help create a quiet indoor setting.

Fast close-in times and lower construction waste

A key advantage SIPs provide in today's tight economy is their ability to dramatically reduce dry-in or 'framing' time. The large, single-piece panels eliminate the need for separate framing, insulating, and sheathing work on-site and enable contractors to install entire wall, roof, and floor sections at one time. Large projects can achieve dramatic reductions in labor because **it is not uncommon to be able to close in building at the rate of 5-6,000 s/f of SIPs per day!** Additionally, the framing inspections can be consolidated into a One (1) time event where the framing, electrical, insulation and shear are all completed at one time.

The design and construction process for SIPs is straightforward. The architect provides the construction documents to a qualified SIP distributor, who converts them into shop drawings that give each panel's specific dimensions. After review by all applicable parties, the manufacturer precuts the panels with window and door openings, including curves, arches, and complex shapes, and precut electrical chases. They are then delivered to the jobsite pre-numbered to coordinate with installation plans. These precut, ready-to-install panels can save up to 60% on combined labor on overall framing, trim/millwork, window, door and flooring, and electrical installations. And as an added result, contractors can reduce jobsite material waste by up to 60% since they do not need to cut individual boards to size at the jobsite. *GENERAL CONDITIONS are reduced significantly for larger projects because the installation, the electrical, the plumbing and the shear are done quickly and repetitively.*

In one institutional building completed in Las Vegas in 2009, ([Shell Building Systems](#)) the use of SIPs reduced close-in time by nearly 80%—from an initial estimate of 118–220 days for CMUs to only 45 days. This resulted in over \$1,300,000 dollars in direct construction cost savings.

Additional environmental advantages

Beyond energy savings and waste reduction, building with SIPs is environmentally responsible in several other ways. With the push for buildings that not only support energy efficiency over the life of the building, but are green in construction materials as well, SIPs offers significant advancements in both.

The main components of SIPs are typically oriented strand board (OSB) and expanded polystyrene (EPS). OSB panels are manufactured from a wide range of fast-growing species and from relatively small trees. The production process utilizes a maximum amount of wood fiber from each tree that is harvested, and because the process is well engineered, the yield of finished product is very high. The EPS component of SIPs is mostly air and only about 2% plastic. A European coalition of EPS manufacturers found that its insulating factor saves more energy than that used to make it.

SIPs are ICC code approved, **Energy Star compliant**, and more cost- and energy-efficient than traditional building methods. **Commercial builders can receive a tax deduction of up to \$1.80 per square foot on new or existing commercial buildings that save at least 50% on heating and cooling energy use.** SIPs also can contribute toward rating points under the Leadership in Energy and Environmental Design (LEED) Green Building Rating System—**up to 23 points in commercial construction.**

Conclusion

As the bottom line in healthcare is positive patient outcomes, it is worthwhile for designers to look at SIPs for advanced building techniques that can be an asset to the delivery of quality care. At the same time, as the United States seeks to become energy independent, the method that are used to construct buildings is playing a major role. SIPs are key to reducing energy demand, as well as providing a host of other green building benefits.

Gary Radzat is President of Shell Building Systems and has been active with SIPs longer than any other SIP company in California. Shell has supervised and installed over 29,000,000 square feet of SIPs in residential, commercial, and institutional construction projects. You may contact SHELL BUILDING SYSTEMS @ 888-669-6542 or at their website: www.shellbuildingsystems.com