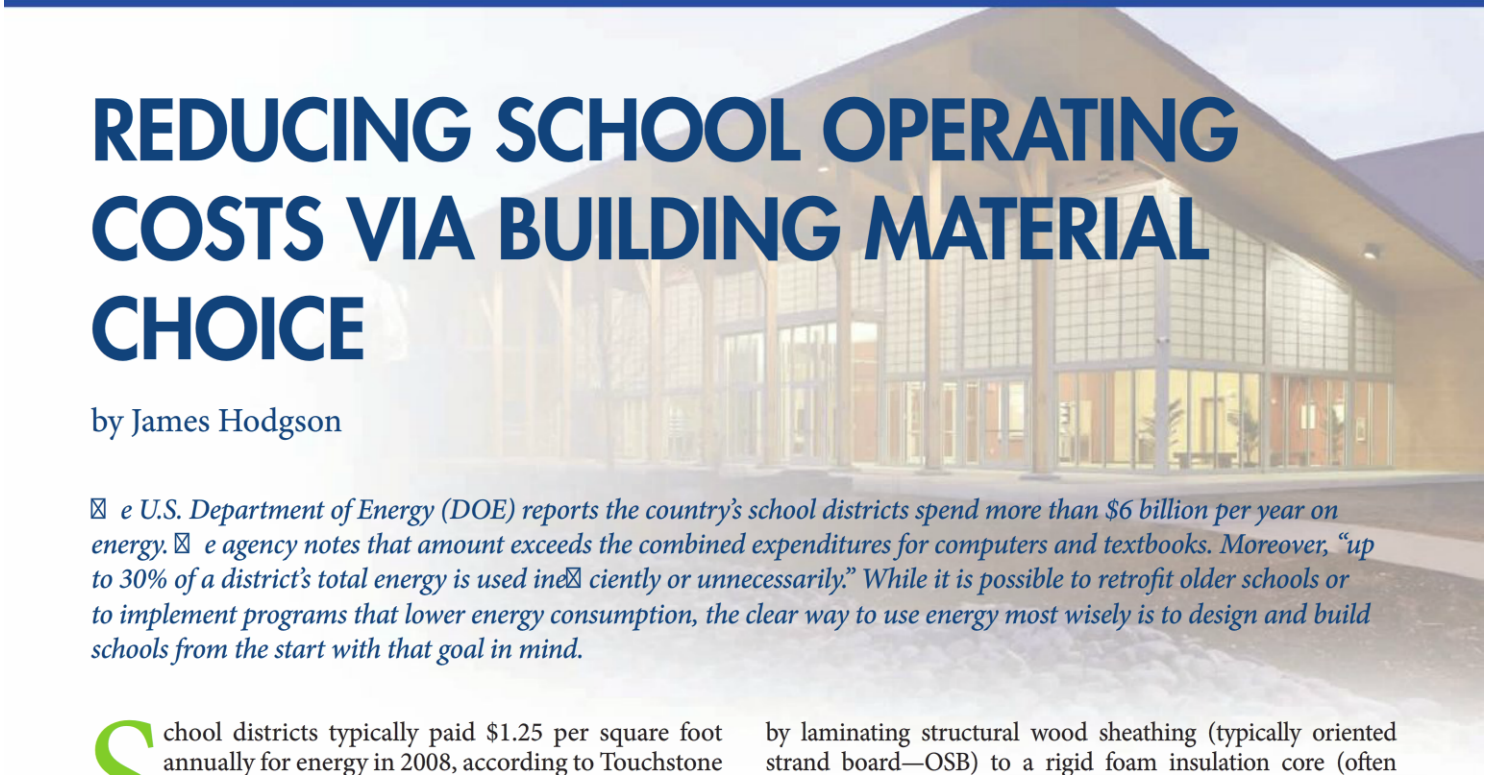

# REDUCING SCHOOL OPERATING COSTS VIA BUILDING MATERIAL CHOICE

by James Hodgson

*The U.S. Department of Energy (DOE) reports the country's school districts spend more than $6 billion per year on energy. The agency notes that amount exceeds the combined expenditures for computers and textbooks. Moreover, "up to 30% of a district's total energy is used inefficiently or unnecessarily." While it is possible to retrofit older schools or to implement programs that lower energy consumption, the clear way to use energy most wisely is to design and build schools from the start with that goal in mind.*

School districts typically paid $1.25 per square foot annually for energy in 2008, according to Touchstone Energy Cooperatives. At that rate, a mid-size district operating 800,000 square feet of facilities spends $1 million or more per year for energy. Rising energy costs cut into schools' ability to fund critical educational needs, from books and supplies to teachers.

While it is possible to retrofit older schools or to implement programs that lower energy consumption, the clear way to use energy most wisely is to design and build schools from the start with that goal in mind. A key is ensuring a tight, well-insulated building envelope. Educational facility professionals at all levels—from private grade schools to public colleges—are developing ultra-energy-efficient schools with advanced building envelope components such as structural insulated panels (SIPs).

SIPs help reduce energy consumption in educational facilities and other institutional and commercial buildings up to 60% and provide a ready way to help achieve net zero energy status. As building heating and cooling are a major part of school operating budget costs, lowering energy use is a key way for administrators to save money year after year.

## A SIPs primer

SIPs are wall and roof components that take the place of the wood or steel framing, concrete tilt-up walls and concrete masonry blocks architects and contractors typically use for educational facilities. The panels are precision engineered, built in a controlled setting and delivered to the jobsite ready-to-install in pieces up to 8 ft by 24 ft. Manufacturers produce SIPs by laminating structural wood sheathing (typically oriented strand board—OSB) to a rigid foam insulation core (often expanded polystyrene—EPS). The resulting panels are strong and durable.

SIPs provide a tighter, more energy-efficient building envelope in several ways:

- reduced air leakage
- less thermal bridging
- reduction, if not elimination, of convective looping

Because they come in large sizes, SIPs greatly reduce the number of joints between structural components. This decreases potential leak points for air. DOE research shows that SIP-built enclosures are about 15 times more airtight than wood-framed construction. Contractors can easily reach and seal joints between SIP panels for an almost airtight fit. A tight structure is crucial for lowering the amount of time districts must run heating or cooling equipment.

Unlike other building methods in which crews fit insulation around structural components, such as insulation batts inserted between wall studs, SIPs have continuous insulation across each panel's height, width and depth. This helps eliminate a common source of heat loss / gain—thermal bridging. In traditional construction, structural elements such as studs and roof joists link the warm and cold faces of a wall or ceiling and provide a path for heat transfer. Because SIPs have unbroken insulation, thermal bridging is reduced within the panels. Some bridging might be present where wood splines join panels, but there are far fewer of these connections than there are studs in a stick-framed wall).

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, so the problem does not occur.

In addition to energy savings, school administrators often choose SIPs for other benefits, including fast construction, improved indoor air quality and lower jobsite waste.

Following are examples of various educational facilities that used SIPs to meet energy savings goals.

## No middling for energy-efficient middle school

The Seattle area is known for its progressive attitude and commitment to green construction. For the Lake Washington School District in suburban Kirkland, Washington, being green isn't just about helping the environment, but also lowering school operating costs.

When the district commissioned a replacement for its Finn Hill Junior High, the project architects specified SIP walls and roof for the net-zero energy 120,000 square-foot building. The design team, led by Mahlum Architects, set an energy consumption target of 25 kBTU per square foot per year, compared to a DOE EnergyStar Target Finder average energy use of 47.3 kBTU per square foot per year. The target is a 47% improvement over the already demanding EnergyStar level, and up to 70% more energy efficient than older schools in the Seattle area.

The SIP panels help save the school district money on its ongoing heating and cooling costs, and allowed for installation of smaller, more cost-effective mechanical systems. By lowering energy demands, the SIPs help make it possible for the school to meet its energy needs through on-site, renewable energy sources such as roof-mounted solar panels.

## Las Vegas school takes no chances with energy savings

Anyone who has been to Las Vegas, Nevada, knows daytime temperatures often exceed 100° Fahrenheit. Keeping students and faculty cool can require near continual operation of air conditioning systems. As with many public school districts, the Clark County School District faces pressure to operate under


The science wing in Seattle's Bertschi School

*Photo credit: Restorative Design*

tight annual budgets. To help reduce operating costs for the replacement Jacob E. Manch Elementary School, the project team selected SIPs.

"Using SIPs cuts down on energy-related costs two ways," said Gary Radzat, President of Shell Building Systems, SIP design and installation consultant for the school. "There's less demand for heating and cooling, so HVAC systems can be substantially smaller, saving on equipment costs. Plus, the ongoing costs to run the equipment are much less." The building team estimated that the Manch School's HVAC operating costs would be to 65 to 70 percent lower than other schools in the Las Vegas area. Additionally, by cycling on and off less frequently, the life of the HVAC equipment would be increased about 75 percent.

## An energy-efficient gymnasium in Montana?

With numerous, wide-open spaces such as gyms, auditoriums and cafeteria, educational facilities provide a special challenge for energy-efficient construction. Such was the case for the 35,000-square foot Health and Wellness Center at Montana's Little Big Horn College. The state is known for its harsh, snowy winters, which can suck the heat out of buildings.

The college serves members of the Apsàalooke Nation (Crow Tribe of Montana). In respect of the tribe's commitment to a healthy environment, the project team designed the center to meet U.S. Green Building Council (USGBC) Leadership in Energy and Environment (LEED) Platinum standards.

"Energy savings is a big part of getting to the LEED Platinum goal," said Ben Mitchell, Project Manager with Fisher Construction, general contractor. "It's hard to get a gym to meet any energy code, let alone LEED Platinum, but the SIPs provide a super energy-efficient envelope—much better than we could get from other products for the same labor and material costs."

The Health & Wellness Center includes an NCAA gymnasium seating approximately 1,300 people. The SIPs will help Little Big Horn College Rams fans stay warm when the winter winds howl during basketball season.

SIPs help keep the Jacob Manch Elementary School cool in the Las Vegas sun.
*Photo credit: Premier SIPS by Insulfoam*

Montana's Little Big Horn College Health & Wellness Center relies on SIPs for energy efficiency
*Photo credit: J K Lawrence Photography, Courtesy of Springer Group and BNIM Architects*

## Camping out in style

Educational facility planners have used SIPs in non-traditional school facilities, as well as typical buildings. One such project was new dorms and a lodge in the San Diego Office of Education's Camp Cuyamaca in the high mountains east of the city.

The camp offers outdoor environmental education for 6th grade students in San Diego County. As such, the project team wanted to create comfortable and environmentally responsible new facilities.

"The extreme mountain climate calls for maximum insulation to dampen the temperature swings," said Ric Davy, principal with Davy Architecture. "We chose SIPs because they help seal out air leaks better than other building methods."

## No cookie cutter schools

When it comes to pre-built components such as SIPs, school administrators might be concerned that buildings will look institutional. However, architects can use SIPs in virtually any building design. Inside and out, SIP schools look no different than any other school.

One example of the design flexibility with SIPs is the new Zuni Christian Mission School serving Native American children in northwest New Mexico. Hibbard Architecture & Planning designed the two-story, 18,000 square-foot school in the Zuni architectural style to be compatible with the historic pueblo site. Commenting on the school's energy efficiency, architect Larry Hibbard said: "New Mexico's high-elevation desert climate with its extreme temperature swings throughout the day and across the seasons makes it essential to have a tight building shell to achieve energy efficiency."

Although SIP buildings are typically one or two stories, the project team for the Wind River Hall dormitory at Western Wyoming Community College developed a four-story SIP building. The SIP walls help provide a tight, well-insulated building envelope and the panels' OSB sheathing provides durability to resist damage from active college students living away from home.

Structural insulated panels are made of wood sheathing laminated to a rigid insulating foam core.
*Photo credit: Premier SIPS by Insulfoam*

Wind River Hall at Western Wyoming Community College
*Photo credit: Premier SIPS by Insulfoam*

## Getting schooled on SIPs

Designers are using SIPs to meet demanding green building goals—from voluntary programs to government-mandated energy codes. For example, the American Institute of Architects (AIA) Committee on the Environment honored Portland (Oregon) Community College's Newberg Center as a 2012 Top Ten Green Project. The award recognizes the project as the first net-zero energy higher education building in Oregon. In addition to high thermal efficiency SIP walls and roof, the building uses natural ventilation and passive cooling to reduce energy consumption.

For educational facility professionals who have not worked with SIPs before, getting started is simple. Contact the Structural Insulated Panel Association for information on SIP manufacturers near you. Some manufacturers provide design assistance and can either help teams adapt a non-SIP design to SIP construction, or can provide code reports and information to design with SIPs from the beginning.

## Other benefits of SIP construction

Energy savings are often the driving choice for educational facility professionals who specify SIPs, but the panels offer other advantages, such as:

***Indoor air quality:***

In addition to helping keep heated or cooled air inside buildings, SIPs' airtight nature also helps seal out common pollutants for healthier indoor air. Blocking or slowing infiltration of radon, pollen, volatile organic compounds (VOCs), lead dust and the like contributes to a better learning environment.

***Lower construction waste:***

Traditional building practices—notably stick framing—generate large volumes of scrap from cut-offs for studs, joists and other framing members. SIPs are planned and made in a factory so eliminate such waste. SIPs can help reduce construction waste by up to two-thirds.

***Fast construction:***

Educational facility professionals typically are under pressure to complete buildings under tight, fixed schedules—often coinciding with the start of classes. Because they come in large-size sections, SIPs install fast. They also eliminate separate work for building the structure and installing insulation. "With the pre-built panels, you just have to piece the building together like a puzzle," said Glen Kamerman, Partner with Kamerman Construction, SIP contractor for the Little Big Horn College Health and Wellness Center. "Using SIPs probably saved about 15 - 20% or better on the installation time." In the Las Vegas Manch Elementary School, SIPs enabled the contractor to reduced the framing schedule from the 121 days allocated by the school district to only 47 days—a 60 percent time savings.

### About James Hodgson

James Hodgson serves on the board of directors of the Structural Insulated Panel Association (SIPA) and is currently general manager of Premier SIPS by Insulfoam. He writes frequently about energy saving construction for educational facilities and other institutional and commercial buildings, and has held several leadership positions with building product manufacturing companies.