Energy-Efficient Institutional Construction With SIPs

BY JAMES HODGSON

Much of the literature on reducing energy consumption in commercial and institutional facilities focuses on operational issues after the building is completed. While active controls that enhance the efficiency of HVAC and lighting are important, how the building is constructed is fundamental to managing energy consumption and costs.

For example, airtightness is a prerequisite for energy savings. According to energy consultant Jeff Knutson, president of A-A Exteriors, Waupaca, Wis., 30 percent to 50 percent of the heat loss in a building occurs via air leakage.

Building Science Corporation, Somerville, Mass., attributes air leakage to three things:

- pressure differentials inside and outside the building caused by wind;
- the stack effect, in which heated air rises and escapes through openings in the building's upper levels, while air infiltrates at lower levels to replace it; and
- combustion in heating appliances and exhaust fans, both of which lower the interior pressure and induce outside air to flow into the building.

Building materials and techniques vary greatly in their ability to retain air and prevent heat loss. Research conducted by the U.S. Department of Energy (DOE) found construction using structural insulated panels (SIPs) is 15 times more airtight than structures built with stick framing. The DOE's Oak Ridge National Laboratory blower door tests demonstrated a SIP enclosure released only 8 cubic feet of air per minute at 50 pascals of pressure (CFM_{50}), compared to 121 CFM_{50} for a similar-size enclosure built with wood framing.

Premier SIPS by Insulfoam

Energy-efficient SIPs work with any architectural style and arrive at the jobsite pre-cut for easy installation.

SIPs are prefabricated components typically used for walls and roofs, and sometimes for floors. They are made of structural-grade wood panels laminated to both sides of a rigid insulating foam core. The panels are often oriented strand board (OSB) and the foam is expanded polystyrene (EPS). The wood panels and foam core

perform as an integrated, engineered system for both structural strength and insulating capability.

In addition to sealing air in the building, SIPs provide continuous insulation across the panels' height, width and depth for exceptional thermal performance. Unlike traditional construction with studs, concrete or CMUs, SIPs have fewer thermal bridges to conduct heat. Taken together, these factors help SIP buildings reduce heating and cooling energy consumption costs up to 60 percent compared to other building methods.

An SIP-built structure "has fewer joints, less-complicated interfaces between conditioned and unconditioned spaces, and it is dramatically easier to make it tight," reports Sam Rashkin, chief architect of the DOE Building Technologies Office.

Architects can incorporate SIPs into virtually any building design up to four stories tall, making them well-suited for doctors' offices, clinics, hospitals, K-12 schools, college classroom buildings and residence halls. Despite being a pre-fabricated component, SIPs are adaptable to a wide range of architectural styles and perform well in a variety of climates.

Although energy savings is a driving factor for using SIPs, building professionals also rely on the panels for faster construction. Large panels (up to 8 feet by 24 feet) arrive at the jobsite pre-sized and labeled for rapid installation, eliminating the need for several separate construction steps. Framing, sheathing, insulation, vapor and sound control are completed in one step—allowing the building to be pieced together like a puzzle and trimming up to 20 percent off traditional installation times.

Rapid construction can be accomplished in school and health care buildings of all sizes. For example, contractors for a 70,000-square-foot elementary school in Las Vegas completed project dry-in in only 47 days, compared to the 121 days allotted in the district's construction schedule. Using SIPs reduced the dry-in time by 60 percent, which was crucial for completing the building in time for the start of school.

James Hodgson is general manager of Premier SIPs by Insulfoam and a past president of the Structural Insulated Panel Association. For more information, visit www.premiersips.com/bc *or* www.sips.org.