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New Oak Ridge Tests Verify SIP Performance Advantage:

Test Room with Four-Inch SIPs Blows Away 2x6 Fiberglass Construction in Controlled Side-By-Side Lab Test

"SIP room 15 times less leaky" - Oak Ridge report

An April 4, 2002 press release from the Structural Insulated Panel Association. For more information, visit the SIPA Website at http://www.sips.org/.

A SIP test room has significantly outperformed a 2x6 stick-framed and fiberglass-insulated wall in controlled testing under identical laboratory conditions at the government's Oak Ridge National Laboratories (ORNL). Preliminary results from a carefully monitored and instrumented study in Oak Ridge's climate simulation laboratory showed that SIP construction can be far more airtight than stick frame construction. "We can put a number on it," says SIPA Executive Director Bill Wachtler. "When it comes to stopping air infiltration and exfiltration, a properly sealed SIP building is almost 15 times better than the competition."

Outstripping the test equipment. The test setup created identical climate conditions for both rooms and measured both the air tightness and the heating energy requirement of the two rooms. Under blower door testing, a room with four-inch SIP walls, a SIP ceiling, a window, a door, pre-routed wiring chases, and electrical outlets showed almost 15 times less air leakage than an otherwise identical room built with 2x6 studs, OSB sheathing, fiberglass insulation, and drywall. In fact, the SIP room was too tight for normal use of the blower door. The test protocol calls for the room to be depressurized in a range from 15 to 50 pascals of pressure, but Oak Ridge reported that "we were unable to go below 75 pascals because the SIP room was so airtight." At 50 pascals of negative pressure, the stick-built room leaked 126 cubic feet of air per minute (CFM), while the SIP room would have leaked only 9 CFM.

"Extraordinarily airtight." "The CFM50 for the SIP test room was almost 15 times less leaky than that measured in the wood-frame," says the Oak Ridge report. "By comparison with the wood-framed room, the SIP room is extraordinarily airtight. These results show that, with care, a very nearly airtight construction is possible with SIPs." "The test results can be reliably extrapolated to the real world," notes the Oak Ridge study. Lab test results for the stick house very closely track the testing data from actual stick houses. While Oak Ridge did not have data from SIP houses to compare to the SIP test room, blower door testing data in SIPA's possession indicates that SIP houses can readily achieve natural air change rates under normal atmospheric conditions of around .05 air changes per hour (ACH), compared to typical stick-house values on the order of .5 to 1 ACH.

Air tightness relates directly to durability. An integral part of the SIP building system is properly sealed joints. One reason for the high performance of the SIP test room is that the joints were properly sealed. When panel joints are sealed properly to prevent air infiltration and exfiltration, moisture is prevented from entering the building envelope and long-term durability is ensured.

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Surprising energy savings. Perhaps more significantly, the room with 4-inch SIP walls used 9% less heating energy than the stick-built room under identical conditions (an indoor temperature of 70°F and an outdoor temperature of 0°F). Those results were verified by continuous monitoring of temperature and heating system data.

R-values are deceiving. The implication is that building with 4-inch SIP walls, in addition to providing far superior air tightness, would more effectively meet energy code requirements than building with 6-inch stick walls. "People look at the insulation R-values for a six-inch stick wall (R-19) and a four-inch SIP wall (R-15), and they think the stick wall is four points better," says SIPA director Bill Wachtler. "But these tests prove that the stick wall is really 10% worse. Let's stop making false comparisons between the two systems. It's time to change the energy rating systems and the energy codes to reflect the true performance of SIPs."

Time to revise energy rating methods. The Oak Ridge testing confirms the observations from real world measurements of identical whole houses built with SIPs and stick framing. For instance, in 1998, three identical Habitat for Humanity houses were built in Plains, Georgia. Two houses used SIP walls and roof, while the third house was built with standard stick framing and fiberglass insulation. All three houses were monitored by scientists from the Florida Solar Energy Center (FSEC).

Real-world SIP house saves 25%. "The three houses were intentionally built with their calculated energy performance (HERS score) similar to each other [all three had HERS ratings of about 83], reports FSEC."The frame house featured energy-related details that resulted in 5.3 air changes per hour at 50 pascals (ACH50). With the home's whole-house fan cover installed, the ACH50 dropped to 3.9, very good for frame construction. However, testing results revealed much better performance in the SIP houses with a measured ACH50 of 1.8. Considering the average indoor-outdoor temperature difference of 30°F, the SIP houses saved 25% [on heating energy] compared to the frame house [during December and January 1998-99]."

The trouble with HERS. What's wrong with this picture? Obviously, the identical HERS ratings did not reflect the true differences between these houses - the ratings underestimated the actual energy saving value of building with SIPs. Congress authorized the development of the Home Energy Rating System (HERS) so that homeowners could easily make comparisons between construction methods based on a simple numerical rating, without having to understand the construction details. The idea is to provide the market with accurate information so that the market can make wise choices. But these identical houses received the same energy rating, even though the SIP house proved to use 25% less energy. With that real-world performance, the SIP houses deserve a HERS rating of 87, not 83. Clearly, the HERS rating, as applied in this case, did not meet the intent of Congress - the identical ratings would not have helped the potential homebuyer to know that the SIP house was, in fact, a better energy buy.

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