SEDAC

The Smart Energy Design Assistance Center (SEDAC) provides advice and analyses enabling private and public facilities in the State of Illinois to increase their economic viability through the efficient use of energy resources. SEDAC is sponsored by the Illinois Department of Commerce and Economic Opportunity in partnership with ComEd and Ameren Illinois Utilities and provides valuable services at no cost to for-profit businesses and public facilities. SEDAC is managed by the University of Illinois at Urbana-Champaign and supported by the 360 Energy Group.

Insulation in New and Retrofitted Buildings

The Case for Continuous Insulation

Insulation is key to ensuring building energy efficiency. There are many types of insulation: fiberglass, cellulose, rock wool, spray foam, and several different forms of rigid board insulation. Most people are familiar with the technique of placing insulation between wall framing elements. These insulated portions of the wall can be fairly effective at reducing the rate of heat transfer between the exterior and interior. The framing elements, however, act as thermal bridges. These bridges, particularly when they are metal, significantly reduce the overall thermal performance by creating a pathway for heat loss or gain. Thermal bridges can represent anywhere from 15 to 25 percent of the envelope area, depending on how walls and ceilings are framed. These thermal bridges not only increase energy usage due to increased heat loss or gain, but may also contribute to moisture and potential mold problems.

Figure 1 illustrates a thermal image of a wall of a brand new building that SEDAC audited recently. Infrared thermal imaging cameras show surface temperatures. The dark vertical stripes are the 6” metal studs and the area between are the insulated portion of the wall. The wall surface temperatures vary from approximately 64°F to 75°F. Outside air temperature was approximately 28°F. Given the cold temperatures common during Illinois winters, the interior surface temperature at the thermal bridge is likely to be low enough that the relative air humidity can promote mold growth. Under these conditions, dew point may be reached and result in the presence of surface moisture. The appearance of mold and moisture both denote serious concerns.

The most common approach to mitigate thermal bridging is application of a layer of continuous rigid insulation to the exterior surface of the studs or to the top of sheathing that has been fixed to the studs. This layer of insulation provides a break to that thermal bridge and significantly reduces energy transfer through thermal bridges.

Low-Rise Residential Buildings."

These codes subdivide Illinois into a northern and southern climate zone, with different code requirements applicable to each zone. In the northern zone, the code now requires walls and roofs constructed with framing members that incorporate a layer of continuous insulation (CI). This code change addresses the thermal bridging problem. Wood and steel framed buildings in southern Illinois can still be constructed without CI.

Figure 1 was taken in a public facility that was built to code in Zone 4. The take-home lesson from this example is that buildings that minimally satisfy code requirements do not necessarily equate to healthy or energy efficient buildings. Codes represent the absolute minimum for compliance. This is why SEDAC encourages designing and constructing to the ASHRAE Standard 189.1 2009 Standard for the Design of High Performance Green Buildings to achieve beyond-code energy savings.

Finally, specifying thicker wall sections does not necessarily result in increased energy efficiency. Table 1 shows a comparison in thermal performance between two wall systems that initially might appear to have a similar capacity for heat resistance. Note that the thinner system has an effective assembly thermal resistance (Assembly R-Value) almost 58% higher than the system which is 33% thicker. Bigger is not always necessarily better.

<table>
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<tr>
<th>System Description</th>
<th>Thermal Performance</th>
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| 6” deep metal studs w/ cavity insulation of R-19 (no CI)  
Total system thickness (w/o finish materials) = 6” |
| Assembly U-Factor = 0.109  
Total Assembly R-Value = 9.2 |
| 3.5” deep metal studs w/ cavity insulation of R-11 plus 1” CI (R-7)  
Total system thickness (w/o finish materials) = 4.5” |
| Assembly U-Factor = 0.069  
Total Assembly R-Value = 14.5 |

Table 1 – Example System Assembly Thermal Performance

Notes for Table 1: Assembly Thermal Resistance values taken from inverse of Assembly U-Factors found in ASHRAE Standard 90.1, 2007 – Table A3.3 Assembly U-Factors for Steel-Frame Walls.

OTHER EVENTS

Various locations and dates.
ICC is offering FREE ENERGY CODE TRAINING for Illinois residents on the 2009 International Energy Conservation Code sponsored by DCEO. Details...

April 7, 2011
Resource Fair and Business Expo. Moraine Valley Community College, Palos Hills. Details...

April 14, 2011
Designing High Performance Buildings: Using an Integrative Design Process
ComEd/Energy Center of Wisconsin
http://www.ecw.org/comedtraining/

April 4, 2011
East Central IL Development Corporation Symposium, Mattoon. Look for the SEDAC booth.

Energy Grants for Rural Small Businesses!

Thinking about making energy efficiency improvements or installing a renewable energy system at your rural business or farm? Keep reading! Grants and loan guarantees are available through USDA Rural Development’s Rural Energy for America Program (REAP). Grants range from $1,500 to $500,000 depending on the project type. Loan guarantees range from $5,000 to $25 million. Feasibility study grants up to $50,000 are also available for renewable energy projects. Grants will not exceed 25% of project costs.

Diverse project types are encouraged under REAP. Energy efficiency projects include everything from improvements to an existing building to equipment upgrades. Renewable energy projects vary from wind and solar to biomass and geothermal.

For more information, contact Rural Development Specialists Molly Hammond (molly.hammond@il.usda.gov) at (217) 403-6210 or Mary Warren (mary.warren@il.usda.gov) at (217) 403-6218 or visit the REAP website at http://www.rurdev.usda.gov/rbs/farmbill/index.html

NEWSLETTER ARCHIVES

To participate in the Smart Energy Design Assistance Program, contact us at: (800) 214-7954 or info@SEDAC.org
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