



Energy Efficiency

FACTSHEET

December 2008

Externally Applied Building Insulation

Externally applied building insulation systems consist of rigid foam insulation and a weatherproof outer coating or cladding applied on the exterior of a building. These systems are used on new construction and retrofit for both residential and commercial buildings.

On some masonry or concrete structures, this may be the most reasonable way to add insulation. For stud-framed walls, this technique adds more insulation than can fit inside the wall cavity. This also reduces infiltration (air leakage through the wall) and effectively slows heat loss through the wall via the studs, which have a much lower insulation value than batt insulation. This is referred to as “thermal bridging.” While adding exterior insulation costs more money, it saves on energy costs and may reduce the cost of framing by adding enough insulation to a 2x4 frame wall to let it match the insulation level of a modern 2x6 wall.

Application Techniques

There are two techniques for applying external insulation. One technique, used primarily in residential construction, consists of 1/2" - 1+" rigid foam board insulation affixed to the exterior of the wall over the insulated wall cavity and studs. Finish siding – wood lap, T-111, or vinyl – is then applied over the foam. Structural stability is provided by the installation of diagonal bracing notched into the studs, eliminating the need for wood sheathing under the foam. In some seismic zones, wall sheathing such as plywood or OSB is required to be applied to the wall studs to provide lateral strength to the structure. The second technique, found in both residential and commercial



Installing EIFS

construction, consists of a multi-layered exterior wall system incorporating thicker rigid foam board insulation (1" - 4") with a finished stucco siding material applied over it. This specific system is known as an External Insulation Finish System (EIFS). Proper installation of the EIFS wall assembly components is critical to avoid leaks and future rot and mold problems.

Applications

Externally applied building insulation is most cost-effectively used during new construction or during replacement of exterior finish material. Where local building codes require R-19 levels of wall insulation, externally applied insulation may enable the builder to reduce dimensional framing lumber from 2x6s to 2x4s, resulting in reduced framing material costs. Exterior insulation can be built into new buildings or retrofit over exterior walls on existing buildings to

Table 1.
Approximate Heating Costs of Insulated Wall Options
 (Per 1,000 square foot wall)

Wall Construction	U-Value	Approximate Heating Costs ¹ of Insulated Wall Options – \$/year
2x4 wood stud with R-13 batt	0.088	\$210.83
2x4 wood stud with R-13 batt + 1" (R-5) exterior XPS	0.057	\$136.56
2x6 wood stud with R-21 batt	0.06	\$143.75
2x6 wood stud with R-21 batt + 1" (R-5) exterior XPS	0.044	\$105.42
2x4 metal stud with R-13 batt	0.124	\$297.08
2x4 metal stud with R-13 batt + 1" (R-5) exterior XPS	0.077	\$184.48
2x6 metal stud with R-21 batt	0.106	\$253.95
2x6 metal stud with R-21 batt + 1" (R-5) exterior XPS	0.069	\$165.31
6" uninsulated concrete	0.61	\$1,461.44
6" uninsulated concrete + 2" (R-10) exterior XPS	0.09	\$215.62

¹ Annual Cost = annual heat loss * cost per therm / (efficiency * 100,000 Btu/therm). Assumes 6655 heating degree day climate (Spokane, Washington). Assumes natural gas heating at 80% efficiency and \$1.20/therm.

reduce heat loss without affecting interior finishes, disrupting occupant activities, or losing interior floor space.

Performance/Costs

Table 1 (see above) shows the annual heating cost of several insulated wall options. Notice that the heating cost for a 2x4 wood stud wall with R-13 batt and 1-inch exterior insulation is less than for a 2x6 wood stud wall with R-21 batt insulation.

Externally applied insulation systems are typically more expensive than batt insulation in stud wall construction, due to the higher per square foot cost of the exterior board insulation and additional installation labor. However, when framing material costs can be reduced due to the use of smaller dimension lumber, some or all of the additional cost is offset. Annual heating and cooling fuel savings will result because overall building insulation values are generally higher than code minimum requirements.

Installed costs for externally applied insulation systems vary greatly depending on exterior finish. In the case of new wood and metal frame construction, the exterior sheathing is applied outside the insulation with no additional cost. For retrofit of wood or metal structures with exterior finish already in place, the insulation will require a new exterior finish system for protection. For new masonry or concrete construction, the insulation will require an exterior finishing system for protection, increasing the system cost by several dollars per square foot. Typical installed cost for insulation alone is \$1.01 per square foot for 1" of R-5 extruded polystyrene blue or pink foam board – \$0.56 for the material, \$0.45 to install (*RSMeans 2008*).

Availability

Most residential and commercial building contractors can provide externally applied building insulation, and the materials are widely available at home improvement centers. See also the EIMA member manufacturers' list and the Oikos website shown below.

Additional Benefit

Application of foam board can minimize potential mold growth and rot in wall cavities. During certain times of the year, when moisture in vapor form enters a wall cavity without exterior foam sheathing it will condense on the inside of the exterior wall sheathing. The presence of water in the wall cavity can cause rot and mold growth. When the correct amount of exterior foam is installed, the wall sheathing (condensing) surface is warmed and no condensation occurs. If no moisture is present mold growth and rot does not occur.

For Additional Information

EIFS Industry Members Association (EIMA)

An industry website that covers both commercial and residential applications. The website contains photos, benefits of EIFS, installation diagrams and tips, and a discussion of maintenance and repair requirements.

<http://www.eima.com/>

EIMA Directory of Members

A list of manufacturers, distributors and contractors specializing in exterior insulation and finish systems.

<http://www.eima.com/abouteima/directoryofmembers/>

Oikos Green Product Information

Use the keywords "exterior insulation finish systems" in the product category search box.

http://oikos.com/green_products/index.php

EIFS Facts

By Douglas Pencille

http://dspinspections.com/eifs_facts.htm

© 2008 Washington State University
Extension Energy Program.

This publication contains material written and produced for public distribution. You may reprint this written material, provided you do not use it to endorse a commercial product.

Please reference by title and credit
Washington State University
Extension Energy Program.

Visit our website at

www.energy.wsu.edu.

WSUEEP08-031B

Updated from original publication in 2000 (WSUCEEP00-139)