

Energy Focus on the Building Enclosure

Whether you call it the building envelope or building enclosure, the exterior of the building is becoming more and more the key focus in reducing the energy usage of our facilities. It is no secret that significant energy savings can be realized through reroofing and exterior renovation projects. There are many financially viable energy saving strategies available. The purpose of this article is to discuss the benefits of exterior energy improvements and why a Building Envelope Energy Evaluation is important to determine the best strategy when considering an improvement project.



■ Thermal imaging is used to assist in the inspection for air and thermal leaks in a building enclosure.

An Opportunity for Improvement

Buildings more than 20 years old rarely have adequate insulation in the roofs and walls. Further, in these older buildings the envelope has aged through its design life and has developed moisture and air leaks. Often, building additions, change of use, and lack of maintenance result in premature failure of an enclosure and its terminations and transitions. The sum of small air leaks in wall transitions, water leaks in the roof, failed sealants at windows and doors, etc. contribute to a significant loss in energy.

Newer buildings can suffer from the same symptoms. While our buildings have become more air tight and better insulated, improper detailing, poor application, or value engineering of whole roof and wall systems have left owners with poorly performing building envelopes. Whether the building is new or old, improvements to the Envelope may not only stop leaks, but can also reduce energy costs.

Benefits of Improvement to the Building Enclosure

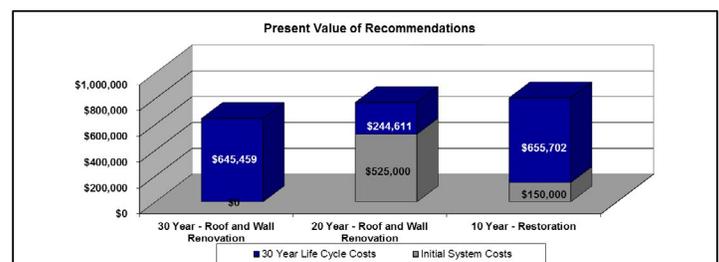
While interior improvements such as lighting, mechanical, and control systems, have a direct impact on utility usage, improvements to the building enclosure have many indirect energy cost saving benefits. Some of these benefits are

1. The building enclosure provides for the insulation of the building's conditioned interior. Increasing the insulation in a building may reduce heating and cooling requirements.
2. Reflective roofing and glazing can reduce the heat gain of the building.
3. Increasing the air tightness of the building enclosure may reduce the loss of conditioned air and the potential for damaging condensation.

The most significant benefit is the chance to water proof and protect the interior of the building. The costs of interior damages due to building leaks can easily exceed the return on investment from an energy improvement. So, stopping exterior problems first ensures energy improvements of any kind will be effective. Additionally, the longer the life of the improvement, the greater the energy benefit will be.

Take roofing for example. Roofing is accepted as a periodic capital expenditure. What usually happens in between these periodic capital expenditures are a series of emergency and maintenance costs in the form of fixing leaks and repairing damage. If a high quality, long term roof is installed, emergency and maintenance costs can be significantly reduced.

A good strategy for a building enclosure improvement must be adopted. All too often inadequate systems are used based upon price that makes the ROI of energy improvements appear more attractive. Moisture intrusion through exterior leaks or condensation within the building will degrade products prematurely resulting in earlier than necessary replacement. A leak free, long lasting, energy efficient enclosure, is the best way to optimize your energy savings.



- A life cycle cost analysis is essential to determining the true benefit of a potential energy saving improvement.

Energy Focus on the Building Enclosure

Building Envelope Energy Evaluation

There are several options available today to determine the energy savings potential of a building enclosure improvement. These energy evaluations provide valuable data that helps determine the economic feasibility of the project. However, often these evaluations are limited to simply adding insulation or a reflective roof surface. There are many other factors which need to be addressed when analyzing the energy efficiency of a solution.

Consider the following:

1. Additional insulation thickness complicates waterproofing details at flashings, and attachment methods, with roof and wall systems.
 2. Air leakage through poor detailing can rob the building of energy regardless of the amount of insulation installed.
 3. Facility operations and processes determine what the benefit of improvements will be. For example, a manufacturing facility with large thermal processes has entirely different needs than a class room or office.
 4. Most insulation provides little to no R-Value when wet. Insulation is expensive and keeping it dry is of the utmost importance. The longer your roof and walls stay leak free, the longer you will realize the energy savings benefit. Replacement cost is very high next to the short term benefits of energy upgrades, so the longer the life span of the systems, the larger the payback.
 5. Simple payback does not take into account the true cost of ownership. A life cycle cost analysis including energy payback benefits is essential to determining the true present value for improvements to current facilities.
3. Analysis of historical utility data
 4. Recommendations for energy saving improvements
 5. A life cycle cost calculation of the improvement project. The dollar value of savings must be weighed against the life expectancy of the solution. The costs of maintenance and replacement offset the true benefit of an energy improvement, so those costs must be included.

Because there are so many factors regarding the energy saving potential of a building envelope upgrade, it is essential that a professional Building Envelope Energy Evaluation be performed.

A building envelope focused energy evaluation should include:

1. An in-depth condition assessment to identify air and water leakage sources, and deficiencies in the roof, walls, windows, and doors.
2. Quantifying the amount of energy leaking through the building envelope through testing and inspection.



■ The building enclosure or building envelope provides the shell that insulates and protects the valuable assets and occupants of our facilities.

In conclusion, we have an exciting opportunity with our existing buildings to renovate and save a great deal of energy. In some cases the energy costs saved through improvements to the exterior will pay for a large portion of the project. The benefit is not only financial. Performance upgrades to the building envelope can also provide a means for modernizing the appearance, increasing the value of a facility, and increasing the comfort of the space for those who use it. A professional Building Envelope Energy Evaluation service is essential to determine the energy saving benefits of roof and wall improvements.

*John L. Pierson, PE
Engineering Services Manager
Clarkson University, 1997, Bachelor of Science in Civil Engineering
Experience Summary: John has over 15 years of experience in the construction industry. His background includes construction materials testing, construction consulting, and design of architectural/structural building systems. His current responsibilities include manager of Design-Build Solutions' Engineering Services Division. John frequently gives AIA technical seminars on building envelope technologies and engineering principals. John currently holds an engineering license in the state of Ohio, and contractor licenses in Arizona, California, Louisiana, Florida, Utah, South Carolina, Nevada, and Tennessee.*

