



## Measuring a Home's Efficiency Case Studies Show Sealing the Building Envelope is Key to Success

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**I**t's been said that the Home Energy Rating System (HERS) Index rating has become for homes what the MPG rating has been for the auto industry in the past few decades. The HERS Index measures a home's energy efficiency – including heating, cooling and water heating – which constitute the homeowner's most out-of-pocket expense for their home other than the mortgage.

The HERS Index score, introduced in 2006, is important for new and existing homes. A confirmed rating can be conducted on existing homes. A list of upgrade options from a HERS Index score for an existing home helps the homeowner determine how to improve the home's efficiency.

The HERS Index score for new construction is fast becoming a critical selling tool for home builders. A favorable score also helps close a sale when compared to homes without the Index score. It provides a clear, accurate report for potential buyers to compare homes and future monthly expenses.

Builders and homeowners can even have a HERS evaluation conducted on their home before it's constructed. All of the home's information can be put into the evaluation software, which gives a projected rating for the finished project. Then builders or homeowners can upgrade or downgrade building materials to reach their desired score and projected utility payments.



Many variables are evaluated to achieve a HERS Index score. The HVAC system including the thermostat and ductwork; water heating system; the entire building envelope including exterior walls above and below grade, windows and doors, ceiling and roof; attic, foundation, crawlspace and floors over unconditioned spaces are all evaluated.

The Index rating is based on a benchmark, the “American Standard Building”, with a rating of 100. The lower the evaluation number, the better. For example, a home that scores 70 is 30% more efficient than the benchmark home with a score of 100. A home with a score of 130 (a typical score for a resale home in the US) is 30% less efficient than the standard. Homes built to the 2004 International Energy Conservation Code are awarded a rating of 100.

Homes achieving a 0 score are so efficient they do not use any purchased energy. Some homes today are, in fact, achieving a score below zero, meaning they are producing more energy via solar panels or wind generators than it uses to sustain a living environment.

The Residential Energy Services Network (RESNET) an independent, national nonprofit organization with a mission to improve home energy efficiency for homeowners and reduce utility bills, is experiencing a growing demand by home builders for RESNET certified raters to evaluate homes with the HERS Index. Their evaluations compare a home’s data to a “reference home”, which is a designed model home in the same climate with the same square footage, shape and style.

One of the key elements in a HERS index rating is the structure’s envelope: the walls, ceiling, windows, doors and roof. This envelope, when properly insulated, keeps the conditioned air in and the unconditioned air out.

Rhino Linings, with a nationwide contractor network, applies spray foam insulation to this envelope; sealing *and* insulating it for maximum energy efficiency. Rhino Linings spray polyurethane foam (SPF) insulations have many advantages over traditional loose or rolled insulation.



Spray foam insulations expand to fill the cavity and have high insulation values. The R-value – a term used to rate an insulation’s ability to resist conductive heat transfer – for closed cell insulation is higher than open cell because it is a denser product. But both products have higher R-values than traditional insulations. ThermalGuard™ OC.5 by Rhino Linings has an R-value of 3.8 when installed at 1 inch, and ThermalGuard has an R-value of 6.8 when installed at 1 inch.

In addition, when you stop air movement you stop moisture movement. The chance of mold and mildew is greatly reduced, as is the rotting of the wood framing. Outside noise infiltration is dramatically reduced when SPF is applied to roofs, walls and floors. With the insulation foam’s expansion qualities, small cracks, gaps and air pockets in the walls, around doors, windows and the

sill plate are filled. There is little room for insects and other household pests.

Don't think sealing and insulation your home really matters? Think again. According to the U.S. Department of energy, 40 percent of a home's energy is lost due to air infiltration and exfiltration through windows, walls and doorways. That's roughly the equivalent of leaving a window open in your home throughout the year. HERS modeling studies conducted by Rhino Linings Corporation show that SPF insulation, used with other responsible building products, can reduce energy usage by up to 50 percent in comparison to traditional products.

Using REM/RATE Software, Rhino Linings calculated the heating and cooling costs of a basic home and compared them to a home that uses good insulation and good building techniques to stop infiltration and exfiltration. The REM/RATE software takes into account climate data, and it complies with National Home Energy Rating Standards as promulgated by RESNET. The results of the two homes are as follows:

**Home #1** is a 3,850 square foot home located in Fayetteville, Arkansas with a consistent HVAC system and utility pricing. When improving the home with spray foam insulation, the heating and cooling costs plummeted from \$1,248 to \$920 for a 26.4% savings. Adding improved windows and doors to the spray foam home improved the savings to 45.8%.

**Home #2** is another 3,850 square foot home located in Minneapolis, Minnesota, again, with a consistent HVAC system and utility pricing. Adding spray form insulation reduced heating and cooling costs from \$2,280 to \$1,515 for a 33.6% savings. And adding improved windows and doors dropped the utility costs to \$1,165, a 48.9% overall savings.

A multi-award winning example of where Rhino Linings SPF products contributed toward record efficiency is the Power Haus, built by Josh Wynne Construction in Sarasota, Florida. The house achieved a minus 22 HERS rating - the lowest HERS rating achieved in the U.S. to date. The negative score reflects Power Haus' ability to produce more energy than it consumes on a net basis.

The building's envelope, the focus of Rhino Linings, is a standard CMU construction wall type with ThermalGuard OC.5 foam insulation filling the open cells of the CMU block and permeable radiant barrier to fight against thermal bridging. Closed cell spray foam insulation from Rhino Linings was also applied exterior of the moisture barrier.

"We were very excited to have Rhino Linings as an integral part of the Power Haus," said Josh Wynne, president, Josh Wynne Construction. "Their insulation was critical in its role to help achieve a record minus 22 HERS Index rating."

Power Haus also earned 118 LEED points, just shy of being the highest scoring LEED home in the country by 1.5 points. Power Haus is also at the

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top of the FGBC standard and NAHB's National Green Building Standard. Josh Wynne Construction was recognized for their achievement with an AURORA award from the Southeastern Building Council.

Rhino Linings is also a proud participant of the VISION House at INNOVENTIONS, an educational case study in green building and living in Epcot® at Walt Disney World®. The addition of ThermalGuard OC.5 spray foam insulation by Rhino Linings in the VISION House completed the exhibit's building envelope. The energy envelope along with the home's HVAC system and solar array make up all of the pieces that are needed to evaluate how efficient the home would be to operate if it were constructed today.

While the VISION House is an exhibit, not a real home, both Disney and the sponsor, Green Builder Media, have worked to make it a practical and interesting teaching tool that demonstrates some of the resource efficient systems that families could choose for their home.

Now it has been rated by a third-party RESNET Home Energy Rater, EnergyLogic, to back up its high-performance claims, and it actually produces more energy than it uses.

Rhino Linings Corporation is a San Diego, California-based manufacturer of ThermalGuard insulation. ThermalGuard OC.5 is an open cell spray foam insulation and ThermalGuard CC2 is closed-cell. Each has specific application benefits and features,

depending upon variables such as geographic region, area humidity and budget.

For more information on SPF insulation and possible state and federal tax incentives, visit [www.rhino linings.com/spf](http://www.rhino linings.com/spf). To find a local installer in your area visit [www.rhino linings.com/local](http://www.rhino linings.com/local).

***About Rhino Linings Corporation:***  
*Since it was founded in 1988, the mission of Rhino Linings Corporation has been to develop proprietary, high-performance polymers based on polyurethane, polyurea and epoxy formulations. Rhino is known for protective coating products that dominate their markets. Now, Rhino has expanded into the building materials market with ThermalGuard Spray Foam Insulation by Rhino Linings and Concrete Solutions®, a line of decorative concrete and repair products. Rhino Linings Corporation has a global retail and industrial applicator network consisting of more than 2,000 independently-owned and operated businesses in over 80 countries.*