Understanding R-Value

When approaching the building of their homes, consumers jump at the opportunity to pick out cabinetry, flooring, hardware, trim, paint colors, and more. They know that they will be surrounding themselves visually with items that cater to their tastes and their lifestyle. However, when asked to consider the type of R-value they would like in their homes, this excitement quickly diminishes. Many consumers simply don't want to think about what is going on behind their drywall; that is until they learn that paying attention to R-values can put money back into their pockets by lowering their energy bills.

R-value is the term most commonly used to describe the thermal performance of building materials. The "R" stands for resistance and refers to a material's resistance to heat flow. In every home, heat flows from warmer to colder spaces. Insulation helps resist this flow of heat. The higher the R-value, the more difficult it is for heat to pass through the material.

The R-values of all the materials that make up the building envelope are critical to the energy performance of the house. Windows and doors have lower R-values than solid walls or ceilings. There's no reason to shy away from windows, however. It is possible to compensate for large window areas by increasing the R-value of solid walls and ceilings. Since air leakage around windows can greatly reduce the R-value of walls, it is important to seal all spaces between the rough opening and the window frame with an air-tight seal. Orienting more windows to the south is another way to lower heating costs, because south-facing windows will actually give you a net heat gain.

Common Misconceptions

"There is a difference between calculated R-value – the value that is given by the manufacturer, and actual R-values. Once the insulation materials are installed during the construction process, other factors such as air infiltration as well as other materials used will determine the actual R value. The actual value is usually lower than the calculated one."

– Josef Fischer,
Thermal Concept Builders, Inc.

All homes built in Wisconsin must conform to the State Energy Code. Every builder must submit energy worksheets with each building permit application that show the R-value of every component that goes into the exterior envelope of the house. This means you can count on the building inspector to verify that the R-value of the products your builder plans on using in your home match the values required on the energy worksheets.

Many builders go above and beyond the State requirements for R-value so they can offer increased energy efficiency as well as the ability to downsize the home's heating and cooling systems, resulting in lower energy costs for the consumer. While this can result in more costs upfront, these costs will be offset by the energy savings you will enjoy from the very first day you move into your home. Keep in mind that while you may be able to pay off your mortgage and own your home free and clear, you can never do that with utility bills. Investing a little more upfront in energy-efficient products will cost you less over time.

R-value is an effective way to measure thermal resistance to heat flow, but it does not measure heat flow through air leakage. According to the U.S. Department of Energy, air leakage accounts for as much as 40% of the total energy lost by an average home. Although it is important to have a home built with high R-values, it is also critical to reduce if not eliminate the cracks, gaps, and voids in a wall cavity. Caulking, air sealing, and the use of spray foam insulation are several ways to reduce air leakage.

Dale Kolbeck from Architectural Homes by Anders, Inc., Josef Fischer, from Thermal Concept Builders, Inc., and Keith Terry from Wisconsin Insulation Services shared their expertise for this article.

Photo below courtesy of Architectural Homes by Anders, Inc.

It's Good To Be Green

"It is hard not to turn on the television or read about being 'green'. Whether or not you believe the earth is warming or not, it makes sense to build more energy efficiently. By adding products with high R-values when building a new home, you reduce the amount of energy required to heat and cool. This lowers utility costs, keeps interior spaces more comfortable, and reduces the amount of greenhouse gases and the burden on the environment. Being good to the environment can also be good for your wallet."

– Keith Terry, Wisconsin Insulation Services

Photo shows the spaces between studs and the box sills with site applied spray foam. Foam sheathing and sprayed in place foams have R-values ranging from R-5 to over R-6 per inch.

About R-Value

"Higher R-values are not always better. There is a point of diminishing return where the extra cost cannot be justified by the amount of savings in the heating bill. At that point, it is more important to spend the money to seal the house from air infiltration and control the fresh air entering the house. A heat recovery unit that heats the incoming fresh air with the heat in the stale exhaust air is another option to lower heating bills in a tightly constructed house."

– Dale Kolbeck, Architectural Homes by Anders, Inc.