

Understanding R-Value

R-Value has long been part of the building and construction industry as the measure of thermal performance of a structure. It has been a long-held belief that higher R-Value is the same as more efficient building insulation. Spray Polyurethane Foam (SPF) has changed some of the most common beliefs associated with R-Value. There are many places online that discuss the R-Value “Myth” or “Fairy Tale”. Before talking about the “Myth” and “Fairy Tale” argument given by some, let's look at a brief definition of two important terms:

Conduction: *transfer of thermal energy between neighbouring molecules in a solid substance such as insulation.*

Convection: *transfer of air molecules through insulation and ultimately the building envelope.*

R-Value is a measure of a material's resistance to heat transfer. The R-Value test performed under the guidelines of ASTM C518 takes into account the resistance of all three heat transfer mechanisms: conduction, convection and radiation; however, convection is given only minor consideration. But unwanted convection through the building envelope is the biggest contributor to energy loss.

Conduction typically accounts for 20% of a building's heat loss, while convection accounts for up to 80% of the energy loss depending on the quality of construction. Any convective loops inside the insulation material are taken into consideration by the R-value test method, but air leakage through the entire composite building envelope is not considered at all. Closed cell spray foam at ¼” can stop 99% of heat loss by convection and at 3” will prevent 95% of heat loss by conduction. Obviously, the same holds true for an air-conditioned structure.

As a contractor in the spray foam industry, questions about R-Value are some of the most common concerns of home owners and builders. To help builders and home owners alike, here is a short collection of Common Questions and Answers:

1. *“The higher the R-Value the better, correct?”*
 - Yes, higher R-Value in your home or building is somewhat better; however, it should not be overrated at all.
 - SPF's ability to create an air-tight seal for your home is the most important factor in creating an energy-efficient, comfortable, and healthy home. About 80% of the energy loss of your home or building is caused by unwanted and uncontrolled air flow through the walls, ceilings and floors.
2. *“What is the R-Value of your product?”*
 - R-Values vary by manufacturer.
 - Closed cell SPF offers higher R-Values per thickness than conventional insulating alternatives.
 - Most importantly, only spray foam provides total air tightness. As a matter of fact, just a little more than 50mm of closed-cell foam provides a vapour barrier. No other insulation system can provide that! When promoting foam, the air-tightness alone should be a compelling reason to insulate with SPF.

Good understanding of R-Value, air leakage and air changes in a home or building is a crucial when selecting an effective insulation solution.