

All R values are stated at 72°F

R-20 can mean as little as R-4 at 32°F

## R Values, Insulation and Building Assembly

All materials and layers in a building assembly have some resistance to heat flow. However, some materials with a k-value lower than about 0.05 to 0.07 W / m · K are deliberately used in building assemblies for their ability to retard the flow of heat. These building products are called **thermal insulations**.

### *Heat flow can occur in one, two, or three dimensions.*

Heat transfer occurs by three primary mechanisms, acting alone or in some combination:

- Conduction,
- Convection,
- Radiation

### *Building Assembly is as important as R Value.*

Insulation is at the heart of the thermal envelope; however it's part of an entire system including siding, sheathing, sheet rock and other materials. How well insulation works in resisting heat flow depends on where and how it is placed and on what, and how much material is used.

The type and amount of material used also affect how well the insulation works. Insulation material is rated by two measurements:

- Its R-value or resistance to heat flow. The higher the R-value, the better the insulation reduces heat flow.
- Its density or the consistent thickness of the insulating material.

R-Value is important, but building scientists know that focusing on R-Value to the exclusion of all other factors can result in disappointment with thermal envelope performance. It's known, for instance, that thermal bridging can reduce the actual energy efficiency of a wall by up to 50 percent. U.S. Scientists have proven that convective flows in very light density attic insulation can reduce its performance by more than 40 percent under winter conditions. Canadian researchers have reported a similar effect in walls.

Testing by labs such as Oak Ridge National Labs, and the National Association of Homebuilders Research Center, among others has shown that convective heat loss (Air Infiltration) will account for about 40% of the total heat loss in a home.

A high-density insulation won't lose its R-value when temperature drops. **For example, a standard 6", R-19 fibreglass batt that has low density, loses up to 80 percent of its insulating value when the temperature drops below 32 degrees.** ATI™ has the highest combination of R Value... 5 and Density... 10.0 lbs per cubic foot of any insulation product available in the market today.

**The combination of these two features allows ATI™ to overcome the noted disadvantages of all other systems. In all cases, the higher the insulation material's density, the better the insulating quality of the product**

#### *Insulation Density*

Regular Fibreglass batt	0.056	lbs per cubic foot
High Density Fibreglass batt	1.1	lbs per cubic foot
Blown Fibreglass	1.15	lbs per cubic foot
High Density cellulose	3.0	lbs per cubic foot
<b>ATI™ Insulation</b>	<b>10.0</b>	<b>lbs per cubic foot</b>