

R-Value

The term R-value stands for thermal resistance and is a measure of the level of resistance to heat flow a given material or an assembly can offer as a result of suppressing conduction, convection and radiation. The thermal resistance for a homogeneous material is mainly associated with the conduction of heat and is a function of material thermal conductivity and thickness (the length of heat flow path) and is expressed in $\text{F}\cdot\text{ft}^2\cdot\text{h}/\text{Btu}$ ($\text{K}\cdot\text{m}^2/\text{W}$). R-value is directly proportional to the material thickness and inversely proportional to its thermal conductivity. Thermal resistance may also be associated with the heat transfer by convection and radiation at a surface. The thermal resistance follows the same analogy as the electrical resistance associated with the conduction of electricity. Therefore, the formulation of heat flows in terms of thermal resistance allows the heat flow through any assembly to be presented as a thermal circuit. Composite components that are characterized by multiple layers with resistances in series and parallel arrangements can be presented by an equivalent thermal circuit. Resistances in series are additive and the overall R-value of an assembly is obtained by summing up the equivalent resistances of all layers comprising that assembly.