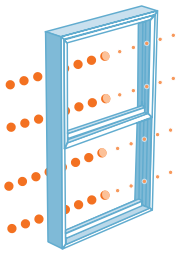
The Facts About
Windows & Heat Loss

We spend millions of dollars every year to heat our homes and businesses. That is why it is so important to understand the role that windows play in how buildings use energy. One of the best ways to measure the effect of windows on building energy use is known as a **U-factor rating**.

Windows Are Not Like Walls and Insulation

The high prices for natural gas, electricity, and home heating fuel that followed the first oil embargo in the early 1970s made energy a high profile, pocketbook issue. Many consumers became aware of **R-values** – a measurement of a product's resistance to heat loss – and learned that materials (floors, walls, and roofs) with higher R-values are more energy efficient. R-values are still used by many building materials, especially insulation.

Windows are very different from insulation in walls and ceilings. Windows let the light in and allow people to see out, and they interact with their environment in ways that insulation does not. They react to outside air temperatures, sunlight, and wind, as well as indoor air temperatures and occupant use. Windows are strongly affected by solar radiation and the airflow around them. R-value does not accurately reflect this interaction. Therefore, the window industry measures the energy efficiency of their products in terms of **thermal transmission**, or **U-factor**. U-factor measures the rate of heat transfer through a product. Therefore, *the lower the U-factor, the lower the amount of heat loss*, and the better a product is at insulating a building.



What's the Difference between U-factor and R-value?

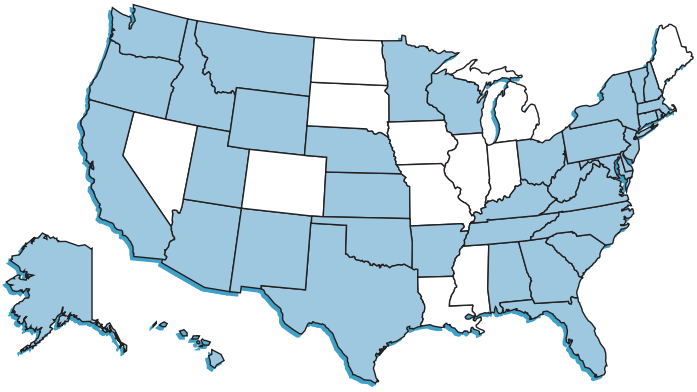
The biggest difference between U-factor and R-value is that U-factor measures the rate of heat transfer (or loss) while R-value measures the resistance to heat loss. R-value is a measure of **conductivity**.

A product with high conductivity will transfer heat quickly, like a hot pan on the stove or a single pane of glass on a cold day. U-factor, on the other hand, takes into account more than conductivity. It also is affected by the airflow around the window and the **emissivity** of the glass.

Emissivity is the ability of a product to absorb certain types of energy (specifically infrared) and radiate that energy through itself and out of a room. A product with high emissivity, such as one pane of clear glass, will transfer over 84 percent of the infrared energy from a warm room outside to the cold air. The lower the conductivity and emissivity of the glass, the lower the rate of heat loss and the lower the U-factor.

There have been significant technological developments over the last 10 years involving **low emissivity (low-e) coatings** on the glass. There are now many glass products available with these low-e coatings, which are typically used in dual pane windows and insulating glass units.

Where NFRC-Certified Products Are Required or Encouraged



NFRC administers an independent, uniform rating and labeling system for the energy performance of fenestration products, including windows, curtain walls, doors, and skylights. For more information on NFRC, please visit our Web site at www.nfrc.org or contact NFRC directly at 301-589-1776.

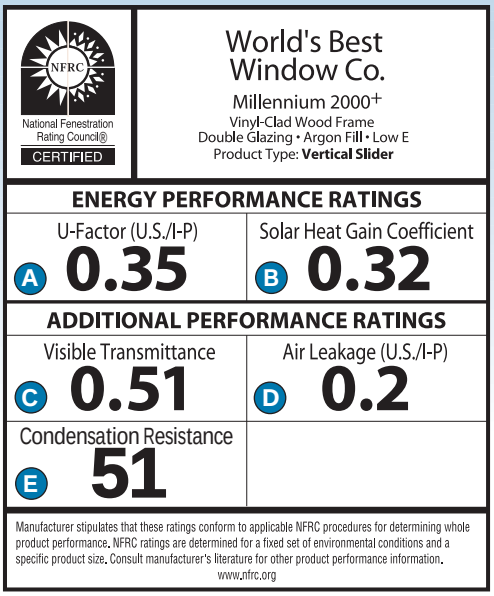
NFRC 100 – The Standard For U-factor Ratings

Prior to the formation of NFRC, window manufacturers used different tools to measure and report the energy efficiency of their products. In 1993, NFRC developed the first consensus method for evaluating the thermal transmission of windows. NFRC 100 "*Procedures for Determining Fenestration Product U-factors*" is now the accepted standard for rating windows, doors, and skylights for U-factor. NFRC 100 established standardized environmental conditions, product sizes, and testing requirements, so that architects, specifiers, builders, and consumers can make an informed choice by comparing the performance of different products fairly and accurately. One of the most important improvements NFRC 100 offered the industry was that the standard determined the heat loss of the entire window unit, including both the frame and the glass. As a result, consumers were provided with a more accurate, credible, and uniform energy rating for fenestration products.

Certified Window Performance

A window rated in accordance with NFRC 100 gets credit for all of the energy efficient features, including low-e glass, thermally improved frames, etc. When comparing window performance, always look for products that have U-factors determined in accordance with NFRC 100. For more assurance that the window has been rated accordingly, ask for NFRC Certified Performance – which is indicated by the use of an **NFRC Label** or **Label Certificate**.

Manufacturers who participate in the NFRC Certification Program have their products listed in the NFRC *Certified Products Directory*, which contains thousand of certified products. The *Directory* is available on-line at **www.nfrc.org**.



A ***U-Factor*** *measures how well a product prevents heat from escaping a home or building. U-Factor ratings generally fall between 0.20 and 1.20. The lower the U-Factor, the better a product is at keeping heat in. U-Factor is particularly important during the winter heating season. This label displays U-Factor in U.S. units. Labels on products sold in markets outside the United States may display U-Factor in metric units.*

B ***Solar Heat Gain Coefficient*** *(SHGC) measures how well a product blocks heat from the sun. SHGC is expressed as a number between 0 and 1. The lower the SHGC, the better a product is at blocking unwanted heat gain. Blocking solar heat gain is particularly important during the summer cooling season.*

C ***Visible Transmittance*** *(VT) measures how much light comes through a product. VT is expressed as a number between 0 and 1. The higher the VT, the higher the potential for daylighting.*

D ***Air Leakage*** *(AL) measures how much outside air comes into a home or building through a product. AL rates typically fall in a range between 0.1 and 0.3. The lower the AL, the better a product is at keeping air out. AL is an optional rating, and manufacturers can choose not to include it on their labels. This label displays AL in U.S. units. Labels on products sold in markets outside the United States may display AL in metric units.*

E ***Condensation Resistance*** *(CR) measures how well a product resists the formation of condensation. CR is expressed as a number between 1 and 100. The higher the number, the better a product is able to resist condensation. CR is an optional rating, and manufacturers can choose not to include it on their NFRC labels.*