

# An Overview of Energy Efficient Windows

Purchasing new windows requires more thought than one would expect. There are many factors that impact a window's performance. For instance, to ensure you are purchasing the most efficient windows appropriate for your location and climate, it is important to understand the importance of ratings like *U-factor* and *Solar Heat Gain Coefficient*.

## U-factor

The U-factor measures the rate of a window's heat loss. Windows with lower U-factors are better insulated and lose less heat than windows with high U-factors. A window's U-factor is important in the winter because a high U-factor would mean that more heat inside a home or building will escape through closed windows, rendering the structure more expensive to heat.

*The Building Code stipulates a maximum U-factor of .45, however the Sustainable Building Program recommends windows with U-factors of .35 or below.*

## Solar Heat Gain

Solar heat gain is an opposite concept to U-factors. The Solar Heat Gain Coefficient (SHGC) measures the rate of a product's heat gain. While U-factors measure the amount of heating going *out* through the window, the SHGC measures the amount of heat coming *in*. Windows with a lower SHGC allow lower levels of solar heat gain.

Blocking solar heat gain is beneficial in hotter climates, but in northern Arizona where cooling is not a concern in the summer, windows with a higher SHGC can help heat homes and buildings in the winter, alleviating the load on mechanical heating systems.

*For passive solar design application, The Sustainable Building Program recommends south-facing windows with a SHGC of .50 or higher.*

## Visible Transmittance

Visible Transmittance (VT) measures the amount of light permitted through the glass and is a number between 0 and 1. Windows with higher VT ratings allow more light to pass through. This maximizes daylighting inside a home and reduces the need to turn on lights during the day.

## Air Leakage

Air Leakage (AL) measures the cubic feet of air passing through a square foot area of window. Lower AL values represent a better ability for a window to resist air infiltration. While a window's AL should be considered, its U-Factor is a more important rating in terms of insulating quality.

		<b>World's Best Window Co.</b> Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider	
<b>ENERGY PERFORMANCE RATINGS</b>			
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	<b>0.35</b>	<b>0.32</b>
<b>ADDITIONAL PERFORMANCE RATINGS</b>			
Visible Transmittance	Air Leakage (U.S./I-P)	<b>0.51</b>	<b>0.2</b>
Condensation Resistance		<b>51</b>	—
<small>Manufacturer certifies that these ratings conform to applicable NFRC procedures for determining what product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not warrant any product and does not accept the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>			

Stickers like this picture can be found on new windows. The sticker provides important information about the window's performance.

Note the ratings for U-factor, Solar Heat Gain Coefficient (SHGC), Visible Transmittance, and Air Leakage.

In northern Arizona, windows should have U-factors below .35 and SHGC above .45.

### **Low-E Windows**

Low-emissivity, commonly referred to as low-e, windows have a special coating on the glass and generally use a low-conductivity inert gas instead of air between panes of glass that reduce the amount of heat that is transmitted through the product. During winter months, low-e reflects heat back into the interior of the building. In the summer months, low-e reflects heat outside.

Low-e windows reduce solar heat gain. Therefore it is important to remember that low-e windows are not good in places where you might want the warming effects of the sun such as on trombe walls and on the south side of buildings. On north-, east-, and west-facing windows, low-e is advantageous and it is acceptable to have a lower SHGC.

Double paned windows have 4 surfaces: (1) the outside of the outer pane, (2) the inside of the outer pane, (3) the outside of the inner pane, and (4) the inside of the inner pane. The majority of windows available have the low-e coating on the second surface. This is good for hotter climates, but in northern Arizona it is best to find the low-e coating on the third surface so that heat is reflected back into the building's interior. In most cases, low-e on the third surface requires a special order from the manufacturer.

### **Window Placement**

**North:** It is best to limit the number of windows on the North side of the home as this is generally the coldest side of the house. Windows on this side are generally weak links in the insulating envelope of the home. Use low-e windows on this side.

**South:** To maximize passive solar heat gain in your home during the winter months when the sun is low in the southern sky, it is best to use windows that are not low-e. At night, cover the windows with insulating blinds to minimize heat loss.

**East and West:** Use low-e windows on both of these sides. It is best to limit the number of windows on the West because it is the hottest side during the summer months. You can use plants on the west side to shade western windows during the summer months.