

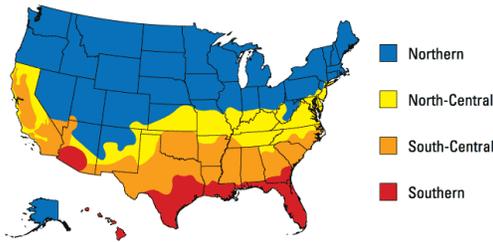
SA

Glazing

What you don't know,  
can hurt you

# WHEN THE SOLUTION

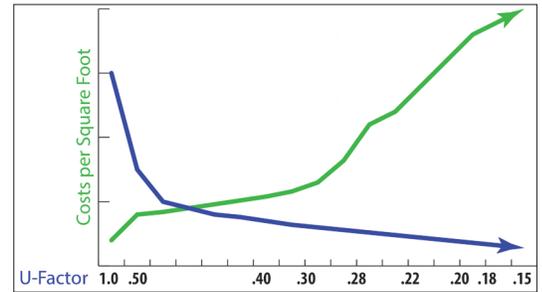
**BACKGROUND** - Since its introduction in 1992, **Energy Star**® certification has been the 'Holy Grail' for manufacturers of electronics, lighting, appliances, and building materials, especially windows. The certification is the consumer's assurance that the product bearing the **Energy Star**® label is among the most energy efficient in its class. And because the designation is given only to the top performers within their class, achieving **Energy Star**® certification has prompted window designers and manufacturers to continually produce better and more energy-efficient products.



Four climate zones define the country

When first adopted, **Energy Star**® certification was fairly easy to achieve. Usually, a thermally improved frame with an Insulating Glass Unit would qualify. However, over the subsequent decades, the Environmental Protection Agency has required gradually improved performance in order to qualify.

**THE QUANDRY** - Keeping pace with these demands for improved performance has taken the combined efforts of the entire industry, including manufacturers and their suppliers of framing, glass, sealants, hardware and other components. Ultimately, every incremental performance improvement comes with an exponentially higher price tag.



Every incremental improvement costs exponentially more

Under **Energy Star**® 6.0, the stringent U-Factor required in the Northern zone (U=0.27 or better) has proven to be an extremely difficult performance level for many manufacturers to achieve. As frequently happens, government regulations and mandates require solutions that are beyond the performance limits of a product's design. When this occurs, manufacturers either replace the old product, or they explore alternate methods of meeting performance criteria, some of which may have unintended consequences.

**CHASING THE NUMBERS** - In thermal testing, administered by the National Fenestration Rating Council (NFRC), windows are measured for various performance attributes – average **Air Infiltration** (AI), overall **Thermal Conductivity** (U-Factor), potential for **Solar Heat Gain** (SHGC), the percentage of **Visible Light Transmittance** (VT), and its overall **Condensation Resistance** (CRF). Each one of these attributes are measured and reported, as they all influence energy consumption and are excellent indicators of how the window will perform when compared to other windows.

**U-Factor** is the measurement of the rate of Heat Loss through the window, so the lower the number, the better. U-Factor takes into consideration framing, glazing and spacer conductivity, therefore it is a rating of the entire window unit.

In order to qualify for **Energy Star**® 6.0, some window manufacturers have had to resort to providing so-called 'S4' Glazing, wherein the interior surface of the window contains an exposed **Low-e** (low emissive) surface.

While this option will result in a lower U-Factor, it also increases interior levels of condensation to potentially damaging and unhealthy levels, particularly in the Northern climate zone.

Because of the risk of sheetrock damage, the potential for dangerous mold growth, and other reasons, Mathews Brothers will not offer S4 Glazing on any of our window or door units.

**VT** is the **Visible Light Transmittance** of the glass unit. This is an important rating to consider when specifying glazing packages that include **Low-e** glass. Low-E glass reduces radiated heat loss, but also reduces visible light.

Since 'S4' Glazing typically involves the introduction of at least one additional layer of Low-e, VT is reduced dramatically, resulting in a condition many consumers find unsatisfactory.

## Know Your Values

 National Fenestration Rating Council®	<b>Mathews Brothers Company</b>	
	Walcott NC / Repl DOUBLE HUNG MBC-M-21-08776-00001 <b>HOLLOW VINYL FRAME</b> LOWE ARGON MNTNS Dual Pane (405331 - 3)	
<b>ENERGY PERFORMANCE RATINGS</b>		
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
<b>0.27</b>	<b>0.31</b>	
<b>ADDITIONAL PERFORMANCE RATINGS</b>		
Visible Transmittance	Air Leakage (U.S. / I-P)	
<b>0.56</b>	<b>≤ 0.3</b>	
<small>Manufacturer stipulate that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warranty the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.</small>		
<small>www.nfrc.org</small>		

**SHGC** is the **Solar Heat Gain Coefficient** of the glass unit. Since the SHGC typically drops with the U-Factor, any potential passive solar heating will also be reduced. This can be an important consideration in the Northern climate zone, where in the winter the days are shorter, and the sun has a lower azimuth.

Introducing additional layers of Low-e glass will also reduce the potential for solar heat gain.

Mathews Brothers offers Low-e coatings that provide very low U-Factor values, while still permitting solar heat gain.

**Air Infiltration** is a measurement of the cubic volume of air that passes between a window frame and the sash, and is expressed as cubic feet per minute, per square foot of window.

This number is typically posted as 'less than or equal to 0.3', since air infiltration is a pass/fail at that number.

Of all the information appearing on the NFRC label, this is perhaps the least important, from a performance standpoint.

# BECOMES THE PROBLEM

**QUESTIONABLE SOLUTION** - When looking at the NFRC label, it's important to remember that a window's overall thermal performance is the result of all its contributing factors, and that frequently an adjustment to one area can have undesirable effects in another. For example, it's easy to reduce the unit's U-Factor by applying additional layers of Low-e glass. However, this would also have the undesirable effect of reducing both VT and SHGC, so it's important to maintain a balance in all areas.

One particular measurement of importance to people in the cold Northern climate zones is the unit's **Condensation Resistance Factor (CRF)**, since the accumulation of excessive condensation can be particularly detrimental not only to the building's structure, but to the indoor air quality as well. Since this number (which ranges from 1 - 100) is not required to be reported, most architects, building professionals and homeowners are unaware of its existence, much less its importance.

Unfortunately, in order to meet **Energy Star® 6.0**, some manufacturers have chosen to resort to so-called "**Surface 4**" or "**roomside**" Low-e glazing. Under this technique, *an additional layer* of low-E coating is placed on **Surface 4 (S4)** of the glass of a traditional improved IG (generally, low-E and argon fill).

According to industry experts, the science behind S4 results in a *higher risk of condensation in cold weather* because the Low-e coating reduces radiant heat transfer from the room to the glass surface. While this does improve the window U-factor by about 0.03, ultimately the room-side glass is cooler, which increases the chance of an excess of water vapor condensing on the glass surface, which can result in sheetrock damage, peeling paint or mold growth.

This is the unintended, yet potentially dangerous consequence of S4 glazing: a dramatic reduction in the **CRF**, with a resulting increase in condensation on interior glass surfaces, and the subsequent damage that results.

**PROTECT YOUR HOME, PROTECT YOUR FAMILY** - How can you be sure the window you are specifying or installing has the recommended CRF for your climate zone? What *is* the recommended CRF for your climate zone?

According to both the American Architectural Manufacturers Association (AAMA) and NFRC, for the cold Northern climate zone, windows should have a **CRF of at least 50**. This will provide a sufficiently warm roomside glass surface to resist moisture. Even with a CRF above 50, windows in highly humid areas of the home (kitchens and bathrooms) may show some occasional condensation, as may other windows in the home during the seasonal transition from Summer to Autumn. This type of condensation should not be a cause for alarm. What should be a cause for alarm would be continuous, daily, uncontrollable condensation.

But how can you find the CRF if it's not on the NFRC label? First: ask the manufacturer, as they are able to provide this information to you. Or you can find out for yourself by visiting [www.NFRC.org](http://www.NFRC.org), hover over "Consumers" in the top menu bar, then click on "Search for a Fenestration Product". This will pull up a search tool, with which you can search by manufacturer, window type, as well as by minimum U-Factors, SCGC and VT. Included in all reports is the unit's CRF.

Better yet: ask them if they use S4 glazing in order to meet **Energy Star® 6.0**. If they are, then chances are the CRF for that unit may not be the best choice to protect your home, and protect your family.

*We've all seen it: interior window condensation forming on cold days. Under Energy Star® 6.0 performance standards, many window manufacturers are making choices that will actually increase interior condensation to levels that may prove to be costly to homeowners.*

*For this reason, Mathews Brothers advocates the display of the CRF on the NFRC Window Label.*

 National Fenestration Rating Council® CERTIFIED	<b>Mathews Brothers Company</b> Walcott NC / Repl DOUBLE HUNG MBC-M-21-08776-00001 HOLLOW VINYL FRAME
<b>ENERGY PERFORMANCE RATINGS</b>	
U-Factor (U.S./I-P) <b>0.27</b>	Solar Heat Gain Coefficient <b>0.31</b>
<b>ADDITIONAL PERFORMANCE RATINGS</b>	
Visible Transmittance <b>0.56</b>	Air Leakage (U.S./I-P) <b>≤0.30</b>
Condensation Resistance <b>62</b>	—
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. <a href="http://www.nfrc.org">www.nfrc.org</a></small>	



**IT'S ABOUT KNOWLEDGE, NOT NUMBERS** - Ever since the first caveman punched the first hole in the first wall of the first cave in order to create the first window, architects, builders and homeowners have been struggling with balancing the dual purposes of windows. When you think about it, windows have two basic functions: allow light into the home, and keep everything else... rain, wind, bad guys... out.

In order to help both professionals and consumers understand and and make informed comparisons among the various window performance criteria, code bodies such as **AAMA** (the American Architectural Manufacturer's Association), **NFRC** (the National Fenestration Rating Council) and **IGMA** (the Insulating Glass Manufacturers Alliance) have developed a series of voluntary standards for windows.

Since compliance with these window performance standards is completely voluntary, typically only the best manufacturers participate, and issue reports of their products' ratings. And since a window is a combination of various engineered systems (framing, glazing, spacers, weatherstripping, etc.), it is important that consumers understand all the tests a window undergoes, and more importantly, how well a product meets or exceeds these tests.

It is only then, when you consider the "whole window performance" that you can make a truly informed buying decision. After all, a good decision is based on knowledge, and not just on numbers.

While only certain performance results are required to be reported, there is a very good reason why we, as an industry, perform all the tests: a window is a dynamic combination of systems, engineered to perform under a wide variety of climactic conditions. That's the science of window manufacturing. The art of window manufacturing balances these criteria to provide a window that performs optimally in all the arenas. Often, a manufacturer will sacrifice one performance standard in order to improve another.

**Energy Star**<sup>®</sup> 6.0 provided a watershed moment in whole window performance. By focusing on one specific metric, the U-Factor, the Environmental Protection Agency has failed to take into consideration other equally important aspects of window thermal performance, some of which affect indoor environmental quality as well as occupant comfort.

Choosing S4 or roomside Low-e will reduce a window's U-Factor, but it does so at the expense of occupant comfort as well as building health. This is the real cost of S4 glazing:

- » *Increased window condensation, resulting in potentially damaging water accumulation*
- » *Reduced Visible Light Transmittance, resulting in an overall darker room*
- » *Reduced Solar Heat Gain making it even more difficult to obtain passive solar heating*

For all the reasons contained herein, Mathews Brothers strongly recommends that architects, builders and consumers consider "whole window performance" when making their window choices.

**And for all the reasons contained herein, Mathews Brothers will never produce windows with S4, or roomside Low-e glass.**

