EVERYTHING YOU NEED TO KNOW ABOUT WINDOW FRAMING AND GLAZING, BUT WERE AFRAID TO ASK

Windows are one of the most important building components you can purchase for your home. Their mission is pretty simple: let light into your home, and keep everything else – rain, wind... bad guys – out. Yet despite their simple nature, windows are an incredibly complex assembly of purpose-designed materials, processed to exacting standards by skilled operators, on purpose-built machines.

Window are assemblies of two components working together: the framing and the glazing. “Framing” is what surrounds and holds the glass (glazing), and what is attached to your home’s wall. It comprises about 15% of the window area. “Glazing” is the Sealed Insulating Glass Unit that you look through. It comprises about 85% of the window area. There are other miscellaneous parts and pieces that also make up a window... locks, operators, weather-stripping, etc.

In order for consumers to make a valid comparison, the window industry has adopted standardized testing methods for both structural strength and thermal efficiency. This objective method prescribes both testing criteria, testing methods and testing sizes. These tests are meant to create “worst case” conditions under which windows could be expected to perform over their lifetime. Since different parts of the country have different climactic and environmental conditions, what’s important in one area may not be important at all somewhere else.

When you understand window terminology, what’s being tested, how it’s being tested, and what the results mean, you are in a better position to make an informed decision.

WINDOW FRAMING

Window framing choices include Wood, Aluminum, PVC (vinyl), Fiberglass, Composites and Steel (primarily used commercially). One of the most common questions asked about windows is, “Which is the best window frame?” We’ll tell you: there is none. Each of the materials has their strengths and their weaknesses, and depending on the installation, could be either an ideal choice or a disasterous one. When considering frame attributes, it is important to bear in mind that every feature does not have a benefit. For example, aluminum, wood and fiberglass are more rigid than PVC and composites, but this rigidity has no benefit, since the window is ultimatly attached to the frame of the home. Flexability does not equal weakness. The true test of the strength of a window's framing material is demonstrated by its **Structural Rating Performance Grade**.

	First Used in USA	Thermal Conductivity (K Value)	Maintenance Requirements	Expansion/ Contraction (Rates*)	Impact Resistance	Frame Joinery	Radius Available	Relative Cost	Market Share
Wood	1609	0.96	Med-High	3.4	High	Mechanical	Yes	Med-High	19%
Aluminum	1945	237	Medium	13.1	Low	Mechanical	Yes	Low-High	4%
PVC	1970s	1.18	Low	30.0	High	Welded	Yes	Low-Med	68%
Fiberglass	1970s	2.08	Low	4.0	High	Mechanical	No	Med-High	7%
Composites	1990s	3.00	Low	16	High	Mechanical	No	Med-High	2%

* 10^{-5} inches per inch per degree Fahrenheit

WINDOW GLAZING

Because so much of a window's thermal performance is tied to the **Insulating Glass Unit** it contains, more research and product improvement has been realized in this area than in any other aspect of window technology. The **National Fenestration Rating Council** (**NFRC**) was established in 1993, to provide objective window energy performance ratings to help consumers make informed purchasing decisions. In **NFRC** testing, windows are evaluated for five different attributes (listed below), but only four are required to appear on the NFRC Label. **Condensation Resistance** is an extremely important metric in colder climates, but it's inclusion on the label is voluntary. It's important to remember that each attribute affects your window's overall performance, and an improvement in one area may result in an undesireable reduction in another.

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.

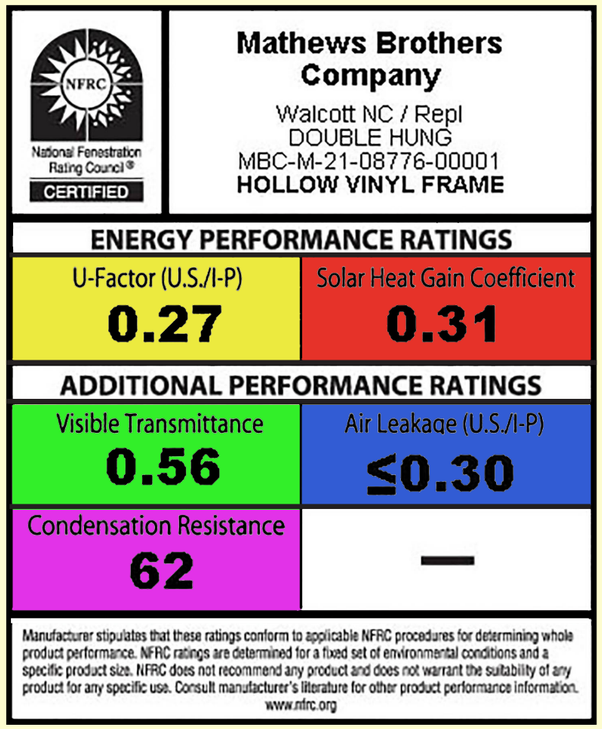
In order to qualify for **Energy Star® 6.0**, some window manufacturers will produce windows with what is referred to as 'S4' or "Roomside" Low-e Glazing, wherein the interior (the 'roomside') surface of the window contains a second, exposed **Low-e** (low emmissive) coating.

While this option does *result* in a lower **U-Factor**, it does so at the cost of decreased **Solar Heat Gain** and **Visible Transmittance**. It also decreases **Condensation Resistance** factor to potentially damaging and unhealthy levels, particularly in the Northern climate zone.

Because of the risk of damage to the sheet rock and interior structure that this increased condesation poses, the potential for consequential dangerous mold growth, and for 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 noticeably, resulting in a darker interior condition many consumers find unsatisfactory.



SHGC is the **Solar Heat Gain Coefficient** of the glass unit. Since the **SHGC** typically decreases when the **U-Factor** decreases, 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.

Air Infiltration is a measurement of the volume of air that passes between a window frame and the sash, and is shown as cubic feet per minute, per square foot of window), and was a major concern of the industry in the early years of energy-efficient windows.

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.

One particular measurement of importance to people in the cold Northern climate zones is the unit’s **Condensation Resistance Factor** (**CRF**), since excessive interior condensation can be particularly detrimental not only to the building’s structure, but to the indoor air quality as well.

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.