Energy performance is one of the most important factors to consider when selecting new windows or doors for your home. When considering what products to purchase for your home, several items must be evaluated in order to understand their true energy performance.

**U-VALUE**
U-value measures the rate of heat loss through a product, and is depicted as a number ranging from zero to one. A window or door with a lower U-value will have a greater resistance to heat flow, therefore improving the ability to keep heat inside the home. U-values are most important in cooler climates where homeowners spend more time and money heating their homes. In those cooler climates, a higher U-value is desired to maintain a warmer interior temperature during the heating season.

**SHGC**
SHGC measures the ability to control solar heat gain through a window or door, and illustrates how much of the sun’s heat enters the home. This rating is measured as a ratio between zero and one. A rating of zero means that no solar heat passes through the product, while a rating of one means that all possible solar heat passes through. SHGC is most pertinent in warm climates where homeowners spend more time and money cooling their homes. In those warmer climates, a lower SHGC is desired to deflect more of the sun’s energy and keep the home cooler.

**VLT**
VLT measures how much light in the visible spectrum passes through the glass of a window or door. VLT has a direct correlation with SHGC, and is measured as a ratio between zero and one. A rating of zero means that no visible light passes through the glass; these windows are typically heavily tinted and have a low SHGC. A window with a VLT rating of one allows all visible light in; and has a high SHGC. A window or door with a rating close to one will likely let in too much light, which could cause fading of furniture or textiles. Most windows and doors manufactured today allow enough visible light transmittance to keep the home comfortably lit without causing damage to interior household items. All of these ratings—U-value, SHGC, and VLT—are set and standardized by two programs: the NFRC and ENERGY STAR®.

**NFRC**
The National Fenestration Rating Council is a non-profit organization that developed the uniform rating system used to measure the energy performance of fenestration products. These ratings are standard for all products, regardless of material type. That means all windows are compared apples-to-apples, regardless of their construction (vinyl, aluminum, or wood for example). The organization was formed in 1989. Since then, the NFRC has been responsible for the development of a number of new window technologies such as low-E coatings, low-conductance spacers, and gas-fill glazing enhancements.

**ENERGY STAR**
ENERGY STAR is a voluntary program established by the Environmental Protection Agency (EPA) that provides energy- and money-saving tips to businesses and homeowners. It provides standards for products to become ENERGY STAR-qualified depending on which region of the U.S. they will be used in. The ENERGY STAR window program was established in 1998. To be recognized as ENERGY STAR-qualified, a window or door must:

- Be manufactured by an ENERGY STAR partner
- Be independently tested and certified by the NFRC
- Have NFRC ratings that meet strict guidelines set by the U.S. Department of Energy

If a product cannot meet these standards, it will not be rated as ENERGY STAR-qualified and therefore cannot be sold with the ENERGY STAR label. These objectives provide manufacturers with incentives to develop the most energy-efficient products possible, which in turn provides money-saving benefits for homeowners. A number of variables, such as glass coatings, number of glass units, spacers, and gas-fill enhancements can affect the energy performance of a window or door.
Factors That Impact Energy Performance

GLASS COATINGS
Standard low-E is a metallic coating that helps improve a window's energy performance by reflecting sunlight, thereby helping to maintain the temperature inside a home. Homeowners can also opt for high-performance, or HP low-E, which is characterized by additional layers of metallic coatings on multiple glass surfaces. This further enhances the products energy performance.

NUMBER OF GLASS UNITS
Today, very few windows are manufactured with only a single pane of glass. Most products are manufactured with two panes of glass, which offer a significant boost in energy efficiency compared to single-pane units. For homeowners looking to make noticeable changes in the energy efficiency of their home, some products can be manufactured with three panes of glass. Any glass unit with more than one pane is called an insulated glass unit, or IGU.

GAS-FILL ENHANCEMENTS
Gas-fill enhancements act as an insulator between dual- or triple-paned windows. The gas helps keep the temperature of the interior panel closer to that of the home. This in turn helps reduce drafts and cold spots and makes for a more comfortable interior space. The most common type of insulating gas is argon, which is denser than air and therefore helps reduce air transfer through a window to improve a home's energy efficiency. Krypton and xenon gases are less commonly used gases that provide varying levels of energy savings.

SPACERS
A spacer's primary function is to maintain the appropriate amount of space between panes in IGU's. Spacers also help prevent condensation build-up between panes of glass, reduce the loss of any insulating gas, and decrease stress put on the glass caused by expansion and contraction due to changes in air pressure.

For years, spacers were made of aluminum, a highly conductive metal. Due to its high conductivity, aluminum spacers can cause high heat loss and can lead to cold spots in the window, as well as condensation along the window's bottom edge. Today, warm-edge spacers are becoming increasingly popular among window manufacturers. Warm-edge spacers eliminate problems associated with metal spacers by using materials that are non-conductive – there is almost no metal used in their production. Two primary types of warm-edge spacers used today are composite laminate and thermoset foam.

Composite laminate spacers are produced with no metal, which means they are completely non-conductive. The majority of the spacer is comprised of air, which improves the window's energy-efficiency, insulating capabilities, and condensation resistance. Thermoset foam spacers are made from organic foam, which enhances the window's sound dampening capabilities. This foam also allows the spacer to expand and contract with changing air pressure, while always returning to its original shape. This reduces the likelihood for stress cracks and seal failure.

Another common spacer material is stainless steel, which provides strength and durability while allowing for expansion and contraction of the window due to changes in air pressure. The use of stainless steel also improves the retention of insulating gas and enhancing the window's energy-efficiency.