The Facts About
Windows & Daylighting

"Daylighting is the illumination of building interiors with sunlight or sky light and is known to affect visual performance, lighting quality, health, human performance, and energy efficiency.

"In terms of energy efficiency, daylighting can provide substantial whole-building energy reductions in nonresidential buildings through the use of electric light controls. Daylight admission can displace the need for electric lighting at the perimeter zone with vertical windows and at the core zone with skylights. Lighting and its associated cooling costs constitute 30-40% of a nonresidential building's energy use."

ASHRAE Handbook of Fundamentals

Why is Daylighting Important?

- For Health and Well-Being

Daylighting the interior space of buildings is an important consideration for architectural design. Studies have shown that increased daylighting improves worker productivity, provides for faster patient recovery, and improves students' grades. Additional benefits of daylighting include keeping our biological clocks in order and relieving stress. These benefits have long been recognized in Europe, where minimum amounts of daylighting and an opportunity to enjoy an exterior view are regulated.

- For Energy Efficiency

Daylighting, especially when integrated with lighting controls, can reduce the dependence on artificial lighting. Lighting systems not only add to electrical demand, they also create heat that must be removed with additional air-conditioning. Building design using perimeter work zones can take full advantage of the benefits of daylighting; and daylighting provides backup lighting whenever mechanical systems fail.

- For Sustainable Design

The trend towards designing buildings that meet present needs without compromising future needs includes an increased reliance upon daylighting and natural ventilation to reduce energy demand and to benefit occupants.

Daylighting and Windows

Visible Transmittance

The potential for daylighting buildings is directly related to the amount of fenestration area installed on the building envelope. It is also related to the amount of light allowed through those systems into the building. The ability of a fenestration product to transmit daylight is called Visible Transmittance (VT).

There are three important categories of light energy within the solar spectrum: ultraviolet (UV), visible, and infrared (IR). The visible transmittance of a fenestration system depends upon: 1) the amount of the visible light segment of the solar spectrum that is transmitted through the glass, and 2) the ratio of frame to glass, which depends upon the window design and frame type.

Spectrally Selective Glass

(*keep the light, reduce solar gain*)

In the past, developers used reflective or tinted glass products in many commercial buildings to reduce solar heat gain through windows. Unfortunately, these products also reduce the amount of visible light. This reduction in visible transmittance can lead to an increase in the amount of artificial lighting needed in buildings. To take advantage of potential savings from daylighting, the industry has seen growth in the use of spectrally selective glass. This type of glass has special

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.

properties that block or re-radiate infrared energy from the sun, reducing solar gain through the windows while maintaining higher levels of visible light transmittance. This type of product is also available for use in residential windows, typically with a spectrally selective low-e coating on the interior surface of insulating glass units.

Daylighting Considerations

The following are some issues that a design professional must consider when utilizing daylight. Seek the assistance of an expert consultant for more detailed information.

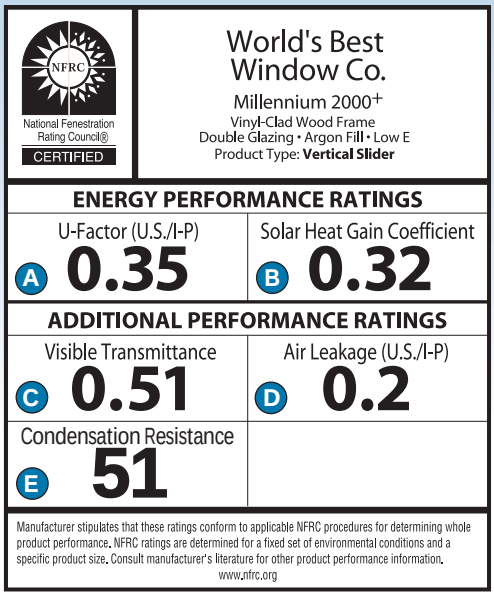
- Remember that the fenestration systems must have a source of daylight to be effective and that the fenestration must be able to transmit the visible light desired.
- Automated daylight lighting controls = energy savings.
- Modify daylighting needs to meet specific tasks (glare).
- Consider light shelves to help distribute daylight and provide shading.
- Incorporate indoor features to increase exposure to daylighting.
- Consider the LSG index, or a "visible light to solar heat gain ratio." References to this index typically recommend an LSG of 1.25 or greater.

The NFRC 200 Standard

The industry standard for rating, comparing, and ranking the Visible Transmittance (and Solar Heat Gain Coefficient) of fenestration products is *NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidents*. This standard should be referenced for fenestration product performance on all architectural specifications.

Certified Visible Transmittance Ratings

Any fenestration supplier or glazing contractor that wishes to obtain certified VT ratings can participate in NFRC's Certification Program. This program authorizes them to place an *NFRC Label* on their products or a *Label Certificate* on site-built systems. Builders, architects, and code officials should use these certified ratings to compare products and to assure that products meet specifications and code requirements. Certified products appear in NFRC's *Certified Products Directory*, which is available online 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.*