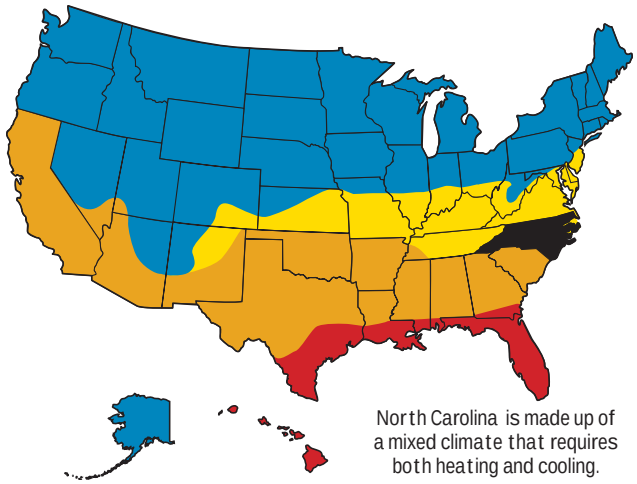
Efficient Windows Collaborative

Fact Sheet: Selecting Energy Ef cient Windows in North Carolina

www.efþcientwindows.org September 2007



North Carolina is made up of a mixed climate that requires both heating and cooling.

ENERGY STAR® Zones

- Northern Climate Zone (mostly heating)
- North/Central Climate Zone (heating & cooling)
- South/Central Climate Zone (heating & cooling)
- Southern Climate Zone (mostly cooling)

Bene ts of High Performance Windows

Cooling and Heating Season Savings

Low-E coatings, gas-þlls, and insulating spacers and frames can signiþcantly reduce winter heat loss and summer heat gain.

Improved Daylight and View

New glazings with low-solar-gain low-E coatings can reduce solar heat gain signiþcantly with a minimal loss of visible light (compared to older tints and þlms).

Improved Comfort

In summer and winter occupant comfort is increased; window temperatures are more moderate and there are fewer cold drafts. Discomfort from strong summer sunlight is reduced.

Reduced Condensation

Frame and glazing materials that resist heat conduction do not become cold and this results in less condensation.

Reduced Fading

Coatings on glass or plastic þlms within the window assembly can signiþcantly reduce the ultraviolet (UV) and other solar radiation which causes fading of fabrics and furnishings.

Lower Mechanical Equipment Costs

Using windows that signiþcantly reduce solar heat gain means that cooling equipment costs may be reduced.

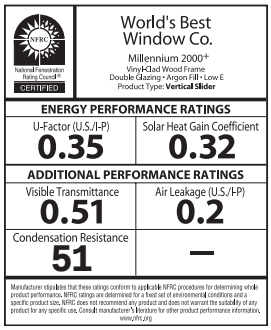
Visit www.efþcientwindows.org for more information on the beneþts of efþcient windows, how windows work, how to select an efþcient window, and what manufacturers provide efþcient products.

1. Look for the ENERGY STARfi

The Department of Energy (DOE) and the Environmental Protection Agency (EPA) have developed an ENERGY STAR (www.energystar.gov) designation for products meeting certain energy performance criteria. Since performance of windows and skylights vary by climate, product recommendations are given for the four ENERGY STAR climate zones. To distinguish between ENERGY STAR products, go to Step 2.

2. Look for Ef cient Window Properties on the NFRC Label

The National Fenestration Rating Council (NFRC) has developed a window rating system based on whole window product performance (www.nfrc.org). The NFRC label provides the only reliable way to determine energy efþcient properties and to compare products. The NFRC label appears on all fenestration products which are part of the ENERGY STAR program. See Page 2 for the recommended properties for this climate. For typical cost savings from efþcient windows in a speciþc location, go to Step 3.

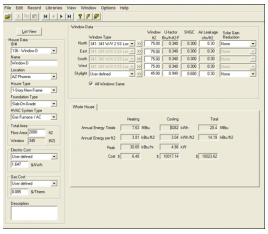


3. Compare Annual Energy Costs for a Typical House

Computer simulations for a typical 2000 square-foot house are used to compare the annual energy performance of different window types. A comparison of the energy performance of a set of windows for this climate begins on Page 3.

4. Customize Energy Use for a Speci c House

A computer simulation program, such as RESFEN (windows.lbl.gov/software/resfen), lets you compare window options by customizing calculations by adding heating and cooling costs for your climate, house design options, and utility rates.



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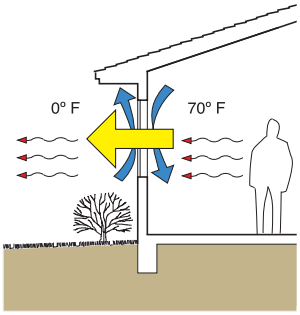
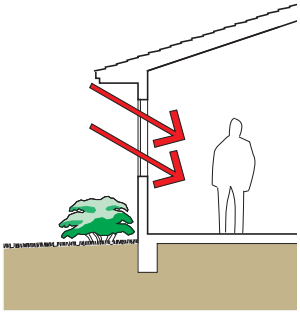
Look for Ef cient Window Properties on the NFRC Label



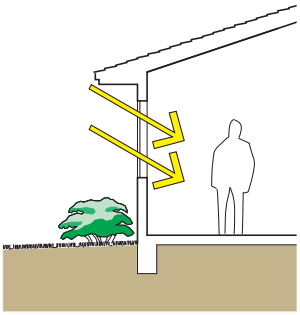
U-Factor

The rate of heat loss is indicated in terms of the U-factor (U-value) of a window assembly. The insulating value is indicated by the R-value which is the inverse of the U-value. The lower the U-factor, the greater a windowÕs resistance to heat ÿow and the better its insulating value. U=U-factor in Btu/hr-sf-ÅF.



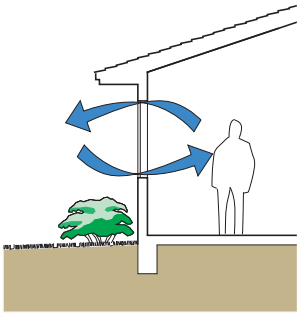
Solar Heat Gain Coefþcient (SHGC)

The SHGC is the fraction of incident solar radiation admitted through a window. SHGC is expressed as a number between 0 and 1. The lower a windowÕs solar heat gain coefþcient, the less solar heat it transmits. Use a computer program such as RESFEN to understand heating and cooling trade-offs. SHGC=Solar Heat Gain Coefþcient in fraction of incident solar angle.



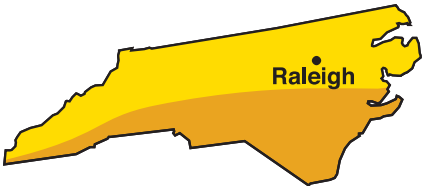
Visible Transmittance (VT)

The visible transmittance (VT) is an optical property that indicates the amount of visible light transmitted. The NFRCÕs VT is a whole window rating and includes the impact of the frame which does not transmit any visible light. While VT theoretically varies between 0 and 1, most values are between 0.3 and 0.8. The higher the VT, the more light is transmitted. A high VT is desirable to maximize daylight. VT=Visible Transmittance in fraction of incident visible radiation.



Air Leakage (AL)

Heat loss and gain occur by inþltration through cracks in the window assembly. Air leakage is expressed in cubic feet of air passing through a square foot of window area. The lower the AL, the less air will pass through cracks in the assembly. While many think that AL is extremely important, it is not as important as U-factor and SHGC. AL=Air Leakage in cfm/sf.



North/Central Climate Zone (heating & cooling)
South/Central Climate Zone (heating & cooling)

Recommended Properties in the North/Central Zone (heating and cooling)

U-factor	Solar Heat Gain Coefþcient (SHGC)	Visible Transmittance (VT)	Air Leakage (AL)
Windows: UÒ0.40 **Skylights: UÒ0.60*** Note: The larger your heating bill, the more important a low U-factor becomes	**Windows: SHGCÒ0.55** **Skylights: SHGCÒ0.40** Note: If you have signiþcant air conditioning costs or summer overheating problems, look for SHGC values of 0.40 or less. If you have moderate air conditioning requirements, select windows with a SHGC of 0.55 or less. While windows with lower SHGC values reduce summer cooling and overheating, they also reduce free winter solar heat gain.	No requirement. Note: Select windows with a higher VT to maximize daylight and view.	No requirement. Note: Select windows with an AL of 0.30 or less.

Recommended Properties in the South/Central Zone (heating and cooling)

U-factor	Solar Heat Gain Coefþcient (SHGC)	Visible Transmittance (VT)	Air Leakage (AL)
Windows: UÒ0.40 **Skylights: UÒ0.60*** Note: The larger your heating bill, the more important a low U-factor becomes.	**Windows: SHGCÒ0.40** **Skylights: SHGCÒ0.40** Note: If you have moderate air conditioning requirements, select windows with a SHGC of 0.55 or less. While windows with lower SHGC values reduce summer cooling and overheating, they also reduce free winter solar heat gain.	No requirement. Note: Select windows with a higher VT to maximize daylight and view.	No requirement. Note: Select windows with an AL of 0.30 or less.

* U-factor qualiþcation criteria based on 2001 NFRC simulation and certiþcation procedures that rate skylights at a 20-degree angle. For more information, see www.energystar.gov.

Efþcient Windows Collaborative
This fact sheet was produced with funding from the Windows and Glazings Program at the U.S. Department of Energy (www.eere.energy.gov) in support of the EWC. For more information, contact:

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Residential Windows Book
Carmody, J., S. Selkowitz, D. Arasteh, and L. Heschong. Residential Windows: A Guide to New Technologies and Energy Performance, 3rd ed. New York, NY: W.W. Norton & Company, 2007.