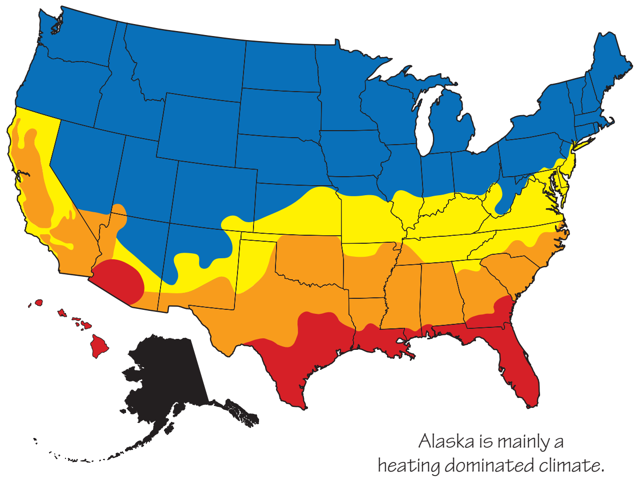
Efficient Windows Collaborative

New Homes: Selecting Energy Efficient Windows in Alaska

www.efficientwindows.org January 2011



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)

Benefits of High Performance Windows

Heating and Cooling Season Savings

Low-E coatings, gas-fills, and insulating spacers and frames result in a lower U-factor, meaning less winter heat loss. Many low-E coatings also reduce solar heat gain.

Improved Daylight and View

Many low-E coatings can reduce solar heat gain significantly with a minimal loss of visible light (compared to older tints and films).

Improved Comfort

With a low U-factor, window temperatures are more moderate and there are fewer cold drafts. With a lower solar heat gain coefficient (SHGC), there is less discomfort from the summer sun.

Less Condensation

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

Reduced Fading

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

Lower Mechanical Equipment Costs

Using windows that reduce solar heat gain (low SHGC) may allow for smaller, less expensive cooling equipment. Windows with a very low U-factor may ensure winter comfort even without the need for heat registers near the windows.

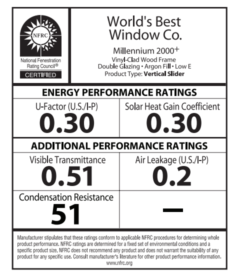
Visit www.efficientwindows.org for more information on the benefits of efficient windows, how windows work, how to select an efficient window, and what manufacturers provide efficient windows.

1. Meet the Energy Code and Look for the ENERGY STAR®

Windows must meet the locally applicable energy code requirements. Windows that are ENERGY STAR qualified typically meet or exceed energy code requirements. To verify if specific window energy properties comply with the local code requirements, go to Step 2.

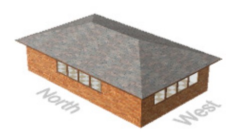
2. Look for Efficient Properties on the NFRC Label

The National Fenestration Rating Council (NFRC) label is needed for verification of energy code compliance (www.nfrc.org). The NFRC label displays whole-window energy properties and appears on all fenestration products which are part of the ENERGY STAR program. For typical cost savings from efficient windows in a specific location, go to Step 3.



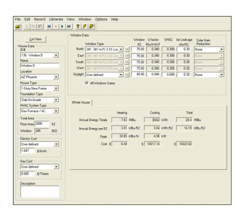
3. Compare Annual Energy Costs for a Typical House

Use computer simulations for a typical 2250 square-foot house 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.



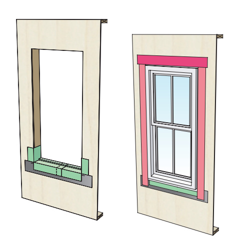
4. Customize Energy Use for a Specific House

A computer simulation program, such as RESFEN (windows.lbl.gov/software), lets you compare window performance options by calculating performance based on utility rates for your climate, house design options, and window design options.

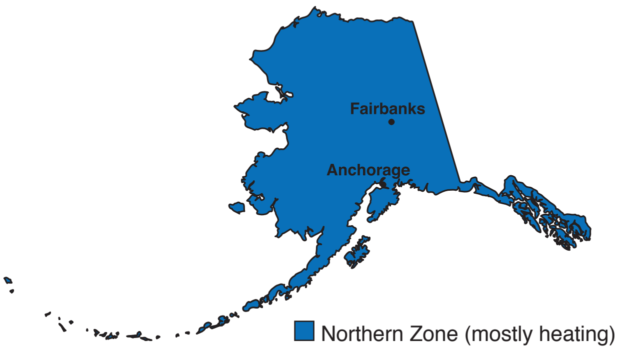


5. Ensure Proper Installation

Proper installation is necessary for optimal window performance, to ensure an airtight fit and avoid water leakage. Always follow manufacturers installation guidelines and use trained professionals for window installation.



Look for the ENERGY STAR



Recommendations in the Northern Zone (mostly heating)

U-factor	SHGC
Windows: U≤0.30 **Skylights: U≤0.55** If windows provide good access to winter solar heat gain (SHGC 0.40 or higher and southern orientation), a U-factor of 0.32 is also acceptable. For superior insulation, windows with a U-factor of 0.22 or less are available.	**No requirement.** If air conditioning is not a concern, look for a high SHGC (0.30-0.60) so that winter solar heat gains can offset a portion of the heating energy need. If cooling is a significant concern and no shading is available, select windows with a SHGC less than 0.40. Select skylights with a SHGC of 0.40 or less.

Recommendations in the North/Central Zone (heating & cooling)

U-factor	SHGC
Windows: U≤0.32 **Skylights: U≤0.55** The larger your heating bill, the more important a low U-factor becomes. For superior insulation, windows with a U-factor of 0.22 or less are available.	**Windows: SHGC≤0.40** **Skylights: SHGC≤0.40** If you have significant air conditioning costs or summer overheating problems, look for SHGC values of 0.30 or less. While windows with lower SHGC values reduce summer cooling demand, they also reduce free winter solar heat gain.

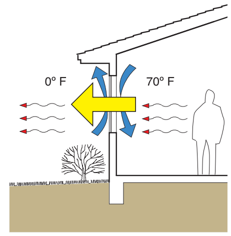
Recommendations in the South/Central Zone (heating & cooling)

U-factor	SHGC
Windows: U≤0.35 **Skylights: U≤0.57** The larger your heating bill, the more important a low U-factor becomes.	**Windows: SHGC≤0.30** **Skylights: SHGC≤0.30** Windows with low SHGC values reduce summer cooling and overheating. However, they also reduce winter solar heat gain.

Recommendations in the Southern Zone (mostly cooling)

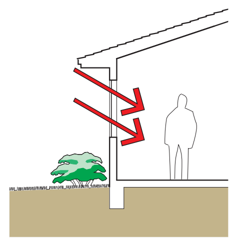
U-factor	SHGC
Windows: U≤0.60 **Skylights: U≤0.70** A low U-factor is useful during cold days when heating is needed. A low U-factor is also helpful during hot days when it is important to keep the heat out, but it is less important than SHGC in warm climates.	**Windows: SHGC≤0.27** **Skylights: SHGC≤0.30** A low SHGC is the most important window property in warm climates.

Look for Efficient Window Properties on the NFRC Label



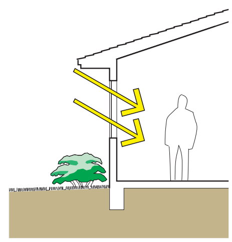
U-Factor

The rate of heat loss is indicated in terms of the U-factor (U-value). This rate of non-solar heat loss or gain through a whole window assembly is measured in Btu/hr-sf-°F. The lower the U-factor, the greater a window's resistance to heat flow and the better its insulating value.



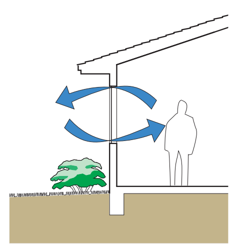
Solar Heat Gain Coefficient (SHGC)

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 window's solar heat gain coefficient, the less solar heat it transmits. Whether a higher or lower SHGC is desirable depends on the climate, orientation, shading conditions, and other factors.



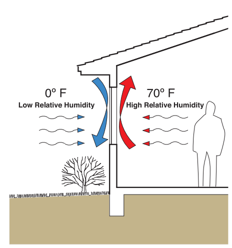
Visible Transmittance (VT)

The VT is an optical property that indicates the amount of visible light transmitted. 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 0.7. The higher the VT, the more light is transmitted.



Air Leakage (AL)

AL is expressed in cubic feet of air passing through a square foot of window area (cfm/sf). The lower the AL, the less air will pass through cracks in the assembly. AL is very important, but not as important as U-factor and SHGC. AL is an optional rating on the NFRC label.

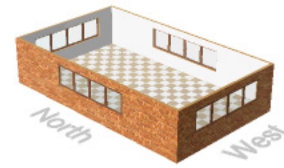


Condensation Resistance (CR)

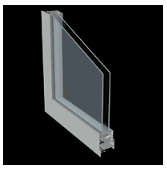
CR measures how well a window resists the formation of condensation on the inside surface. CR is expressed as a number between 1 and 100. The higher the number, the better a product is able to resist condensation. CR is meant to compare products and their potential for condensation formation. CR is an optional rating on the NFRC label.

Comparing Window Performance in Anchorage, Alaska

The annual energy performance figures shown here assume a typical new 2250 sq. ft. house with 15% window-to-floor area. The windows are equally distributed on all four sides of the house and include typical shading (interior shades, overhangs, trees and neighboring buildings).

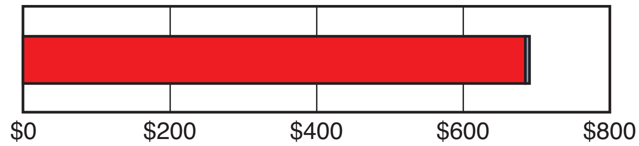


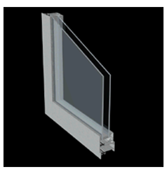
Case Studies / Properties / Annual Energy Use



CASE 1
double glazing
clear glass
metal frame with thermal break

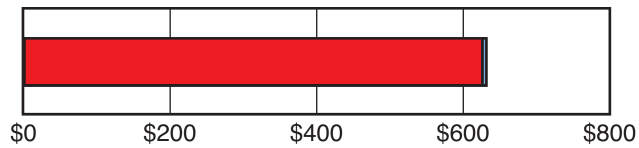
U = 0.56–0.70
SHGC > 0.60





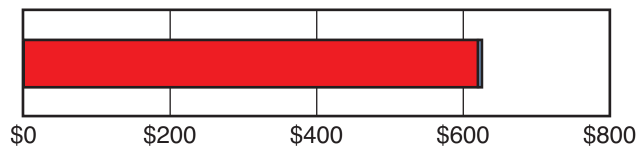
CASE 2
double glazing
low-E coating (high solar gain)
argon gas fill
metal frame with thermal break

U = 0.41–0.55
SHGC = 0.41–0.60



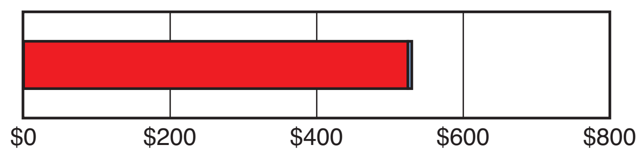
CASE 3
double glazing
clear glass
non-metal frame

U = 0.41–0.55
SHGC = 0.41–0.60



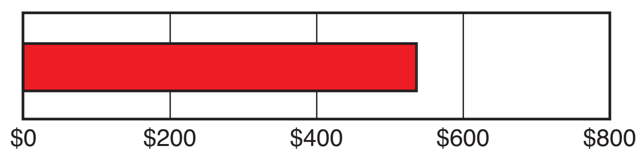
CASE 4
double glazing
low-E coating (high solar gain)
argon gas fill
non-metal frame
thermally improved

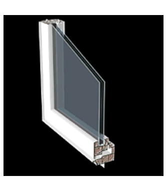
U = 0.26–0.30
SHGC = 0.41–0.60



CASE 5
double glazing
low-E coating (moderate solar gain)
argon gas fill
non-metal frame
thermally improved

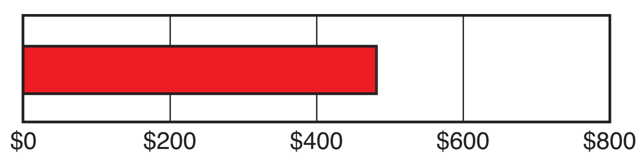
U = 0.26–0.30
SHGC = 0.26–0.40





CASE 6
triple glazing
low-E coating (high solar gain)
argon gas fill
non-metal frame
thermally improved

U ≤ 0.20
SHGC = 0.26–0.40

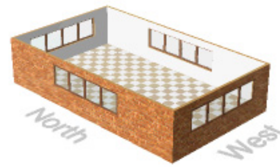


Annual Heating Cost | Annual Cooling Cost

Note: The annual energy performance figures shown here were generated with regression expressions provided by Lawrence Berkeley National Laboratory (windows.lbl.gov/EStar2008). Results assume a typical new 2250 sq ft house with 15% window-to-floor area. The windows are equally distributed on all four sides and include typical shading (interior shades, overhangs, trees, and neighboring buildings). U-factor and SHGC are for the total window including frame. The costs shown here are annual costs for space heating and space cooling only and thus will be less than total utility bills. Costs for lights, appliances, hot water, cooking, and other uses are not included in these figures. The mechanical system uses a gas furnace for heating and air conditioning for cooling. Natural gas prices used are projections of the average natural gas price for the heating seasons of 2010-2020 in real 2009 dollars. Projections are based on state-specific natural gas retail price data by the Energy Information Administration (EIA) for the heating seasons of 2006-08 and are adjusted based on EIA projections of national natural gas price trends for 2010-2020. Electricity prices used are projections of the average electricity price for the cooling seasons of 2010-2020 in real 2009 dollars. Projections are based on state-specific electricity retail price data by the Energy Information Administration (EIA) for the cooling seasons of 2006-08 and are adjusted based on EIA projections of national electricity price trends for 2010-2020 (www.eia.doe.gov).

Comparing Window Performance in Fairbanks, Alaska

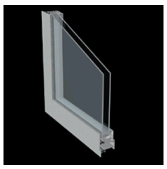
The annual energy performance figures shown here assume a typical new 2250 sq. ft. house with 15% window-to-floor area. The windows are equally distributed on all four sides of the house and include typical shading (interior shades, overhangs, trees and neighboring buildings).



Case Studies

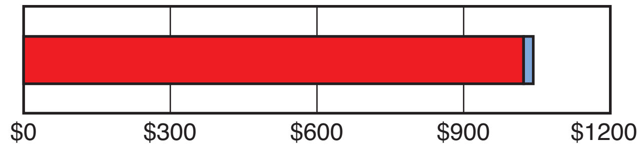
Properties

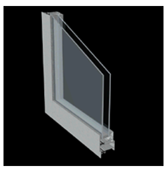
Annual Energy Use



CASE 1
double glazing
clear glass
metal frame with thermal break

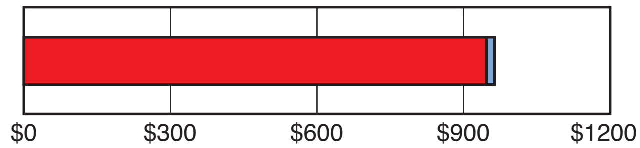
U = 0.56–0.70
SHGC > 0.60





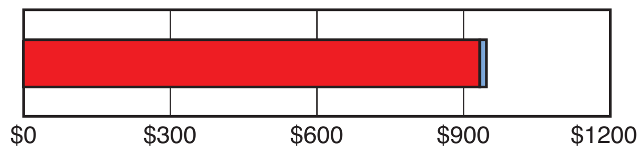
CASE 2
double glazing
low-E coating (high solar gain)
argon gas fill
metal frame with thermal break

U = 0.41–0.55
SHGC = 0.41–0.60



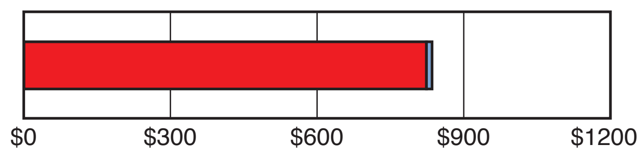
CASE 3
double glazing
clear glass
non-metal frame

U = 0.41–0.55
SHGC = 0.41–0.60



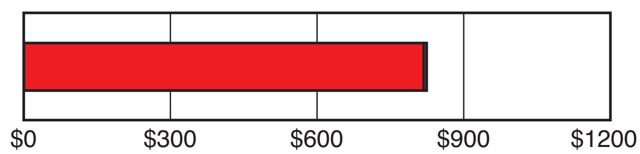
CASE 4
double glazing
low-E coating (high solar gain)
argon gas fill
non-metal frame
thermally improved

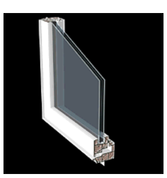
U = 0.26–0.30
SHGC = 0.41–0.60



CASE 5
double glazing
low-E coating (moderate solar gain)
argon gas fill
non-metal frame
thermally improved

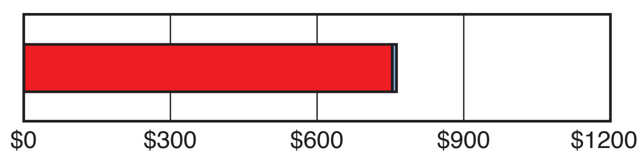
U = 0.26–0.30
SHGC = 0.26–0.40





CASE 6
triple glazing
low-E coating (high solar gain)
argon gas fill
non-metal frame
thermally improved

U ≤ 0.20
SHGC = 0.26–0.40



Annual Heating Cost
Annual Cooling Cost

Note: The annual energy performance figures shown here were generated with regression expressions provided by Lawrence Berkeley National Laboratory (windows.lbl.gov/EStar2008). Results assume a typical new 2250 sq ft house with 15% window-to-floor area. The windows are equally distributed on all four sides and include typical shading (interior shades, overhangs, trees, and neighboring buildings). U-factor and SHGC are for the total window including frame. The costs shown here are annual costs for space heating and space cooling only and thus will be less than total utility bills. Costs for lights, appliances, hot water, cooking, and other uses are not included in these figures. The mechanical system uses a gas furnace for heating and air conditioning for cooling. Natural gas prices used are projections of the average natural gas price for the heating seasons of 2010-2020 in real 2009 dollars. Projections are based on state-specific natural gas retail price data by the Energy Information Administration (EIA) for the heating seasons of 2006-08 and are adjusted based on EIA projections of national natural gas price trends for 2010-2020. Electricity prices used are projections of the average electricity price for the cooling seasons of 2010-2020 in real 2009 dollars. Projections are based on state-specific electricity retail price data by the Energy Information Administration (EIA) for the cooling seasons of 2006-08 and are adjusted based on EIA projections of national electricity price trends for 2010-2020 (www.eia.doe.gov).