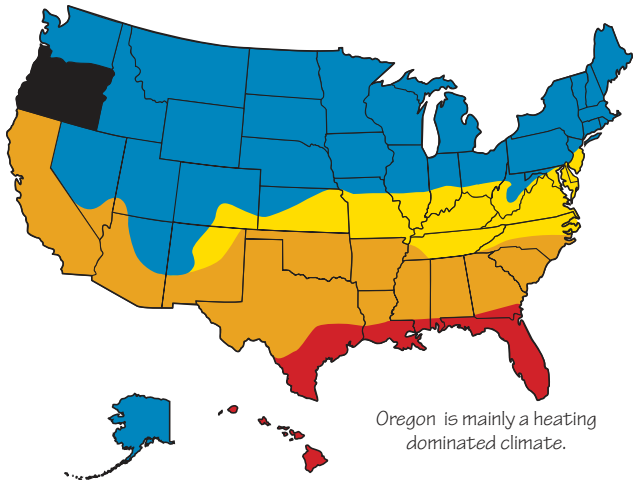
Efficient Windows Collaborative

Fact Sheet: Selecting Energy Efficient Windows in Oregon

www.efficientwindows.org September 2007



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

Cooling and Heating Season Savings

Low-E coatings, gas-fills, and insulating spacers and frames can significantly 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 significantly with a minimal loss of visible light (compared to older tints and films).

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 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 significantly reduce solar heat gain means that cooling equipment costs may be reduced.

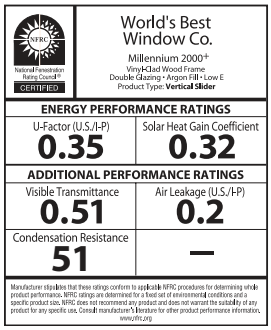
Visit www.efficientwindows.org for more information on the benefits of efficient windows, how windows work, how to select an efficient window, and what manufacturers provide efficient windows.

1. Look for the ENERGY STAR®

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 Efficient 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 efficient 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 efficient windows in a specific location, go to Step 3.

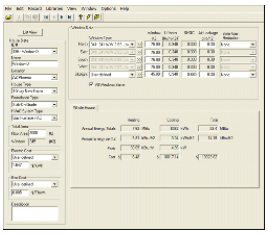


3. Compare Annual Energy Costs for a Typical House

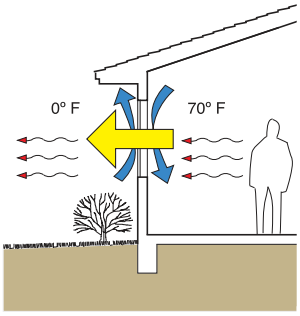
Computer simulations for a typical 2000 square-foot house are used to compare the annual energy performance of different window types. A comparison of the energy performance of a set of windows for this climate begins on Page 3.

4. Customize Energy Use for a Specific 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.

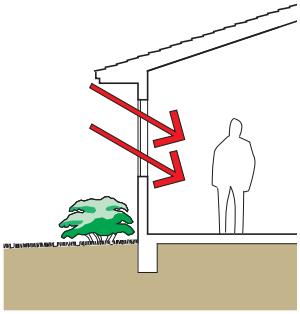


Look for Efficient Window Properties on the NFRC Label



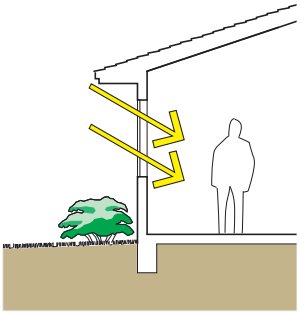
U-Factor

The rate of heat loss is indicated in terms of the U-factor (U-value) 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 window's resistance to heat flow and the better its insulating value. U=U-factor in Btu/hr-sf-°F.



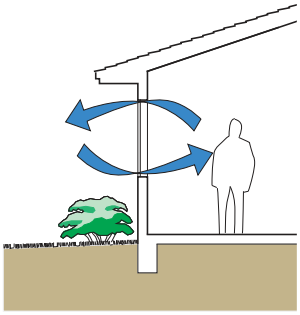
Solar Heat Gain Coefficient (SHGC)

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. Use a computer program such as RESFEN to understand heating and cooling trade-offs. SHGC=Solar Heat Gain Coefficient in fraction of incident solar angle.



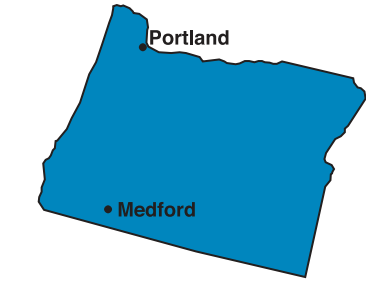
Visible Transmittance (VT)

The visible transmittance (VT) is an optical property that indicates the amount of visible light transmitted. The NFRC's 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 infiltration 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.



Northern Climate Zone (mostly heating)

Recommended Properties in the Northern Zone (mostly heating)

U-factor	Solar Heat Gain Coefficient (SHGC)	Visible Transmittance (VT)	Air Leakage (AL)
Windows: U≤0.35 **Skylights: U≤0.60*** Note: If air conditioning loads are minimal, windows with U-factors as high as 0.40 are also energy-efficient if the Solar Heat Gain Coefficient is 0.50 or higher.	No requirement. Note: To reduce heating, select the highest SHGC you can find (usually 0.30-0.60 for the U-factor ranges required in colder climates) so that winter solar gains can offset a portion of the heating energy need. If cooling is a significant concern, select windows with a SHGC less than 0.55. Select skylights with a SHGC of 0.55 or less.	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 qualification criteria based on 2001 NFRC simulation and certification procedures that rate skylights at a 20-degree angle. For more information, see www.energystar.gov.

Efficient 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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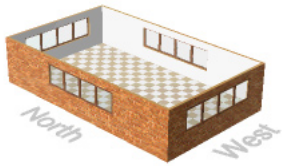
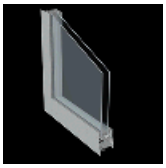
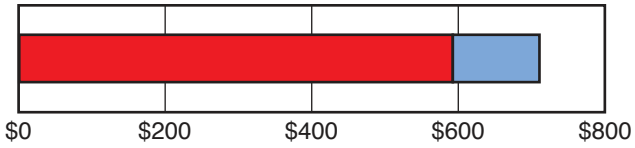
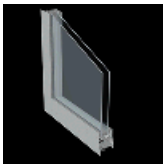
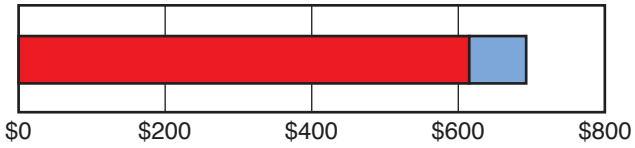
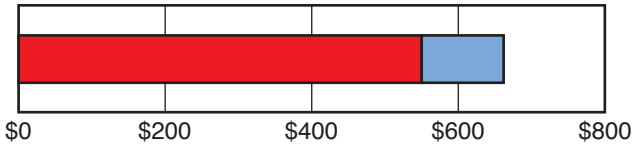
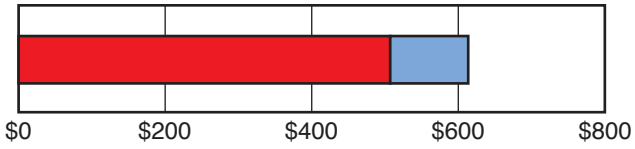
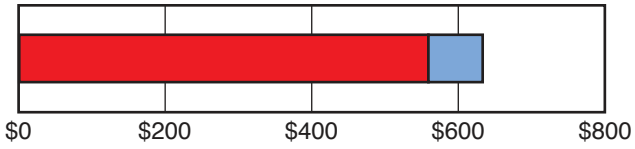
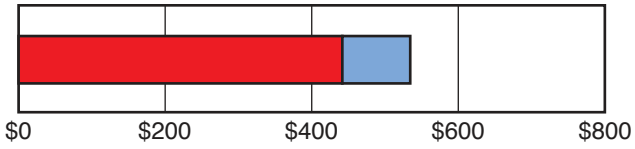
www.ase.org
www.efficientwindows.org

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.

Comparing Window Performance in Medford, Oregon

The annual energy performance figures shown here were generated using RESFEN for a typical, new 2000 sq. ft. house with 300 sq. ft. of window area (15% of 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 aluminum frame w/ thermal break	U = 0.63 SHGC = 0.62 VT = 0.62	
 **CASE 2** double glazing low-E coating (low solar gain) argon gas fill aluminum frame w/ thermal break	U = 0.47 SHGC = 0.33 VT = 0.53	
 **CASE 3** double glazing clear glass vinyl/wood frame	U = 0.49 SHGC = 0.56 VT = 0.58	
 **CASE 4** double glazing low-E coating (high solar gain) argon gas fill vinyl/wood frame	U = 0.37 SHGC = 0.53 VT = 0.53	
 **CASE 5** double glazing low-E coating (low solar gain) argon gas fill vinyl/wood frame	U = 0.34 SHGC = 0.30 VT = 0.50	
 **CASE 6** triple glazing low-E coating (high solar gain) argon gas fill insulated vinyl frame	U = 0.18 SHGC = 0.40 VT = 0.49	

*Note: The annual energy performance figures shown here were generated using RESFEN for a typical (new construction) 2000 sq ft house with 300 sq ft of window area. The windows are equally distributed on all four sides and include typical shading (interior shades, overhangs, trees, and neighboring buildings). U-factor, SHGC, and VT 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. The prices shown in the figures are average energy prices projected for the period of 2006-2030, which is the typical effective lifetime of a window installed in 2005. The bases for these prices are average state-specific 2005 prices for electricity during the cooling season and for natural gas during the heating season, adjusted by the projected difference between average national 2005 prices and average national prices between 2006 and 2030. Energy Information Administration (EIA) data (www.eia.doe.gov) is used for the 2005 prices. The 2006-2030 prices are based on EIA projections of future prices in real 2004 dollars that have been adjusted to take into account an estimated future inflation rate of 3 percent annually. RESFEN is a computer program for calculating the annual cooling and heating energy use and costs due to window selection and is available from Lawrence Berkeley National Laboratory (windows.lbl.gov/software/resfen).

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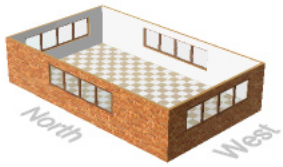

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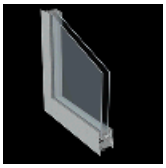
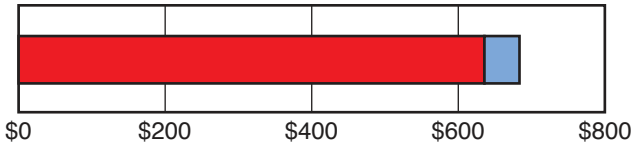
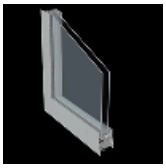
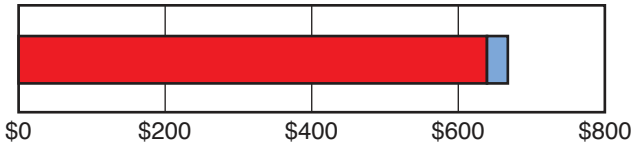
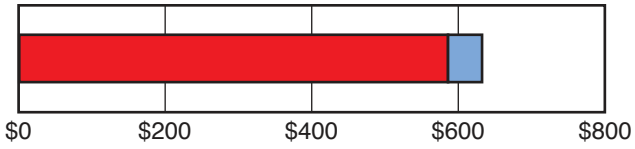
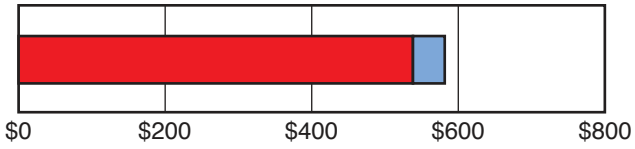
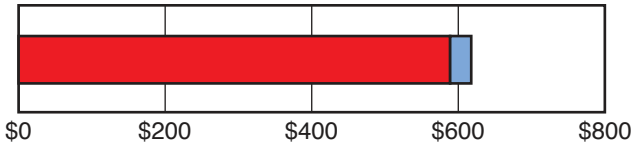
 **CASE 1** double glazing clear glass aluminum frame w/ thermal break	U = 0.63 SHGC = 0.62 VT = 0.62	
 **CASE 2** double glazing low-E coating (low solar gain) argon gas fill aluminum frame w/ thermal break	U = 0.47 SHGC = 0.33 VT = 0.53	
 **CASE 3** double glazing clear glass vinyl/wood frame	U = 0.49 SHGC = 0.56 VT = 0.58	
 **CASE 4** double glazing low-E coating (high solar gain) argon gas fill vinyl/wood frame	U = 0.37 SHGC = 0.53 VT = 0.53	
 **CASE 5** double glazing low-E coating (low solar gain) argon gas fill vinyl/wood frame	U = 0.34 SHGC = 0.30 VT = 0.50	
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