## Window Selection - Evaluate

Windows provide views to the exterior, light, and natural ventilation. Selecting windows takes into account many issues such as appearance, cost, and performance. Follow these window selection steps to find energy-efficient windows.

In the United States, in winter months, the sun rises in the southeast and sets in the southwest with a relatively low arc in the sky. In summer months, the sun rises in the northeast and sets in the northwest with a relatively high arc in the sky. The sun is directly south at “solar noon”. The directional orientation of windows can have a significant impact on building heating and cooling.

In heating-dominated climates, major glazing areas should generally face south to collect solar heat during the winter when the sun is low in the sky. In the summer, when the sun is high overhead, overhangs or other shading devices prevent excessive heat gain.

To be effective, south-facing windows in colder climates should have a solar heat gain coefficient (SHGC) of greater than 0.6 to maximize solar heat gain during the winter, a U-factor of 0.35 or less to reduce conductive heat transfer, and a high visible transmittance (VT) for good visible light transfer.

Windows on east-, west-, and north-facing walls should be minimized while still allowing for adequate daylight. It is difficult to control heat and light through east- and west-facing windows when the sun is low in the sky, and these windows should have a low SHGC and/or be shaded. North-facing windows collect little solar heat, so they are used only for lighting. Low-emissivity (low-e) window glazing can help control solar heat gain and loss in heating climates.

In cooling-dominated climates, particularly effective strategies include preferential use of north-facing windows and generously shaded south-facing windows. Windows with low SHGCs are more effective at reducing cooling loads.

The following steps are important when selecting energy efficient windows.

1. **Meet code**. At a minimum, window energy ratings need to comply with the requirements of the code applicable to the home’s jurisdiction. Many states and municipalities have adopted the International Energy Conservation Code (IECC). The IECC divides the country into climate zones with varying window performance requirements, giving preference to insulating value in cold climates and to solar heat control in hot climates. The latest version of the IECC can be purchased here: <http://shop.iccsafe.org/2015-international-energy-conservation-coder-1.html>. To find the latest code that has been adopted in a specific state, visit this website: <https://www.energycodes.gov/status-state-energy-code-adoption>.

2. **Look for the ENERGY STAR label**. Not all jurisdictions have adopted up-to-date energy codes. The ENERGY STAR label helps ensure that windows have above-average energy performance. In most locations, ENERGY STAR criteria exceed energy code requirements. Learn more about Energy Star certified products and requirements here: <https://www.energystar.gov/products/building_products/residential_windows_doors_and_skylights/buying_installing_right_product>.

3. **Look for performance properties on the NFRC label**. How these technologies such as low-e coatings, gas fills, and high performance frames affect a window’s energy performance depends on the combined effects of the window’s components. The only reliable way to determine whole-window energy properties is the ratings certified by the NFRC. In most jurisdictions across the United States, building energy codes require that windows bear the NFRC label so that the code compliance of their energy ratings can be verified.

4. **Use the Window Selection Tool (**<http://www.efficientwindows.org/new_selection1.php>**)**. The basic thermal and optical properties of a window (U-factor, SHGC, and VT) can be identified if a residential window is properly labeled with an NFRC label. However, residential consumers often still do not know how these basic properties influence annual heating and cooling energy use. The Efficient Window’s Collaborative’s Window Selection Tool can help determine the most energy-efficient window selection. The annual energy use from computer simulations for a typical house in 100 U.S. cities can be compared for 29 generic window options.

The tool provides information to:

• Compare how various window or skylight types affect estimated energy cost for a typical house in a specific location.

• Find manufacturers who offer windows and skylights in the categories shown.

• Learn more about manufacturers’ specific product options.

These comparisons assume average conditions. The effect of windows on a specific home’s heating and cooling costs may vary depending on glazing area, shading, and orientation, and on thermostat set points, equipment efficiency, etc.

5. **Predict Performance** Using either RESFEN (<https://windows.lbl.gov/software/resfen/resfen.html>) or BEopt (<https://beopt.nrel.gov/>) to simulate the conditions of a specific building with specific windows. It is possible to take into account the impact of shading, orientation, and glazing area.