Humboldt Energy Task Force
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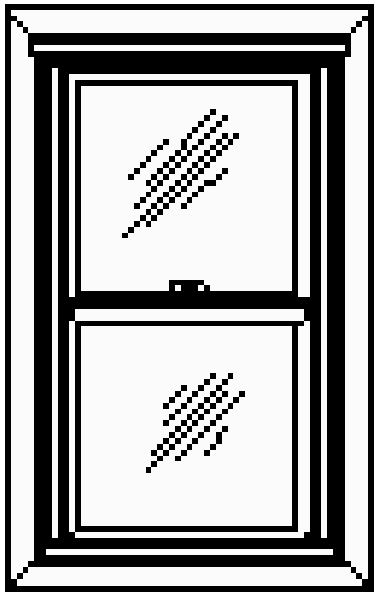
FAST FACTS ABOUT WINDOWS FOR YOUR HOME

Energy Brief # 6



Humboldt Energy Task Force

INTRODUCTION

Windows typically comprise 10–25% of a home's exterior wall area. They bring light, warmth, and beauty into buildings and give a feeling of openness and space to living areas. They can also be major sources of heat loss in the winter and heat gain in the summer, accounting for 25–50% of the heating and cooling needs, depending on the climate. However, when properly selected and installed, windows can help minimize a home's heating, cooling, and lighting costs.

COLD-WEATHER RETROFITS

- *Reduce air infiltration*—Eliminate or reduce paths of heat flow by caulking around the edges of drafty frames and installing weather stripping around the contact area between fixed and movable sections of a window joint. Use rope caulk to seal windows that will remain shut for winter.
- *Install an additional barrier*—Create an insulating area of dead air space by installing storm windows or a plastic barrier over existing windows.
- *Install window treatments*—Install insulating shades that incorporate layers of insulating material, a radiant barrier, and a moisture resistant layer to prevent condensation. Install a tightly fitting valence over the top of existing curtains to keep air from circulating behind the curtains and creating a chill.
- *Improve passive solar gain*—Clean south-facing windows and remove exterior screens for the winter to increase solar gain up to 40%.

WARM-WEATHER RETROFITS

- *Install window treatments*—Install white window shades or blinds to reduce solar heat gain by 40-50%. Tightly woven insect screens or bamboo shades will reduce visibility, but they also reduce heat gain by 60-80%. Close south- and west-facing curtains during the day, and close the windows.
- *Increase shade*—Install awnings on south-facing windows that do not have roof overhangs, plant trees, or build a trellis to block the sun's radiation and reduce solar heat gain.
- *Retrofit existing windows*—Hire a professional to install retrofit window films to cut glare and block heat.

For information and resources about energy-efficient windows…

U.S. Department of Energy Consumer Energy Information, "Advances in Glazing Materials for Windows" at http://www.eren.doe.gov/erec/factsheets/windows.html

U.S. Department of Energy Consumer Energy Information, "Energy-Efficient Windows" at http://www.eren.doe.gov/erec/factsheets/eewindows.html

U.S. Environmental Protection Agency Consumer Fact Sheets, "High-Performance Windows" at http://yosemite1.epa.gov/estar/homes.nsf/content/ResFactSheets.htm

Rocky Mountain Institute, "Home Energy Brief # 2, Windows" at http://www.rmi.org/sitepages/pid171.php

Minnesota Department of Commerce Home Energy Guides, "Windows and Doors" at http://www.commerce.state.mn.us/pages/Energy/InfoCenter/pdfs/windoors.pdf

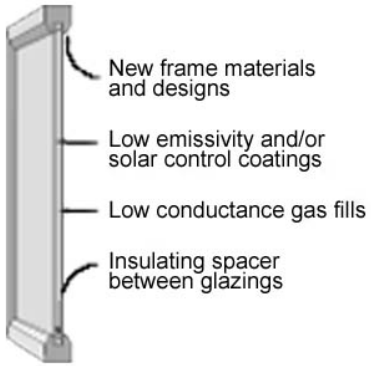
Humboldt Energy Task Force

The Humboldt Energy Task Force (HETF) is a coalition of local government agencies working together to provide local energy conservation tools and solutions for Humboldt County. For more information please contact:

- City of Eureka (707) xxx xxxx
- City of Arcata (707) xxx xxxx
- Humboldt Co. (707) xxx xxxx

BENEFITS OF ENERGY-EFFICIENT WINDOWS

- Lower heating/cooling bills—High–performance windows are better insulated and more air-tight. These features reduce energy consumption for heating and cooling, resulting in lower utility bills and homes that are less expensive to operate.
- Improved comfort—High–performance windows reduce conductive heat losses and gains, resulting in warmer interior surfaces during the winter and cooler interior surfaces during the summer. In addition, improved frames reduce drafts and provide more consistent temperatures throughout the house.
- Reduced condensation problems—High–performance windows stay warmer in the winter resulting in drier windows with fewer condensation-related problems. Condensation can stain fabrics, lead to mold and mildew build-up, and can cause damage due to the freeze/thaw cycle in cold climates.
- Improved indoor air quality—High–performance windows often have air tightness ratings of 0.2 cfm/ft or less, which reduce the amount of unconditioned air leakage into a house. This air leakage can bring in dirt, dust, and other impurities that can negatively affect indoor air quality.
- Reduced wear on home furnishings—Low-E coatings can block up to 98% of the ultraviolet radiation emitted by the sun. This radiation causes curtains, window treatments, carpeting, and furniture to fade and wear faster.
- Reduced outside noise infiltration—High–performance windows often utilize multiple glazing and insulated frames. These features reduce unwanted noise from the outside.
- Improved home resale value—The benefits provided by high–performance windows can translate into a higher resale value.



Source: "High-Performance Windows Fact Sheet" EPA Energy Star® Program
http://yosemite1.epa.gov/estar/homes.nsf/content/ResFactSheets.htm

NEW WINDOW TECHNOLOGIES

In recent years, many technological advances have been made that significantly enhance the thermal performance of windows. Thermal performance is rated as an R-value (resistance to heat flow) or the reciprocal U-value (conductance of heat flow). The R-value of a window is affected by the following factors:

- type and number of layers of glazing material (glass, plastic, treated glass)
- size of the air space between the layers of glass
- thermal resistance or conductance of the frame and spacer materials
- edge sealing effectiveness

The following window technologies can be used independently or in combination, but must be selected based on climate to optimize performance:

- *Improved framing materials*—Window frames are available in a variety of materials including aluminum, wood, vinyl, and fiberglass. Frames may be primarily composed of one material, or they may be a combination of different materials such as wood clad with vinyl or aluminum-clad wood. Each frame material has its advantages and disadvantages, as listed in the table that follows.
- *Special coatings*—Special surface coatings are used to reduce heat transfer through a window. Low-emissivity (low-e) glass has a special surface coating to reduce heat transfer through the window from the living space, while allowing the full amount of light to pass through. Windows manufactured with low-e films typically cost about 10% to 15% more than regular windows, but they reduce energy loss by as much as 30% to 50%. Reflective glass is coated with a reflective film to reduce solar heat gain during the summer months.
- *Low-conductance gas fills*—Double- or triple-pane windows have insulating air- or gas-filled spaces between each pane. Each layer of glass and the air spaces resist heat flow. The width of the air spaces between the panes is important, because air spaces that are too wide (more than 5/8 inch or 1.6 centimeters) or too narrow (less than 1/2 inch or 1.3 centimeters) have lower R-values. Argon and krypton gas transfer less heat than does air.
- *Improved thermal breaks and edge spacers*—Spacers are used to separate multiple panes of glass within the windows, but they can conduct heat and lead to condensation along the edge of the window. Window manufacturers now sandwich foam separators, nylon spacers, and insulation materials between the glass inside their windows.
- *Improved edge sealing*—Windows are now being tested and rated for air tightness. A rating of 0.2 cfm/ft (cubic feet per minute of air leakage per linear foot of window edge) or lower is considered good. The best windows have a rating of 0.15 cfm/ft or lower.

ADVANTAGES AND DISADVANTAGES OF VARIOUS WINDOW FRAMING MATERIALS

Framing Material	Advantages	Disadvantages
Aluminum	• ideal for strength • corrosion and deterioration can be avoided	• conduct heat rapidly (Thermal resistance can be improved by placing continuous insulating plastic strips between the interior and exterior of the frame.) • prone to condensation • prone to corrosion and electro-galvanic deterioration (can be avoided through anodizing or coating)
Wood	• high R-values (resistance to heat flow) • not affected by temperature extremes • not prone to condensation	• require maintenance in the form of periodic painting or staining • can swell, leading to rot, warping, and sticking if not properly protected
Vinyl	• moderate R-values (resistance to heat flow) • available in a wide range of styles and shapes • easily customized • competitively priced • require very low maintenance	• less inherent strength than other framing materials (Larger-sized windows are often strengthened with aluminum or steel reinforcing bars.)
Fiberglass	• highest R-values (resistance to heat flow) • will not warp, shrink, swell, rot, or corrode • can be filled with fiberglass insulation to increase R-value	• not yet widely available • require maintenance in the form of periodic painting or staining