BERKELEY LAB

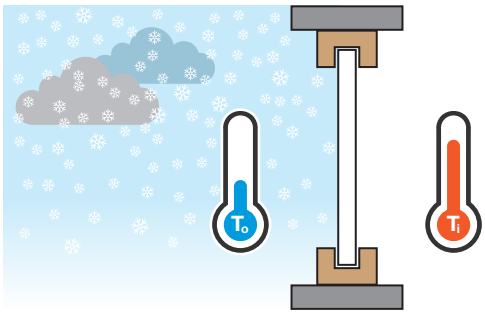
BUILDING TECHNOLOGY & URBAN SYSTEMS DIVISION

Energy Technologies Area

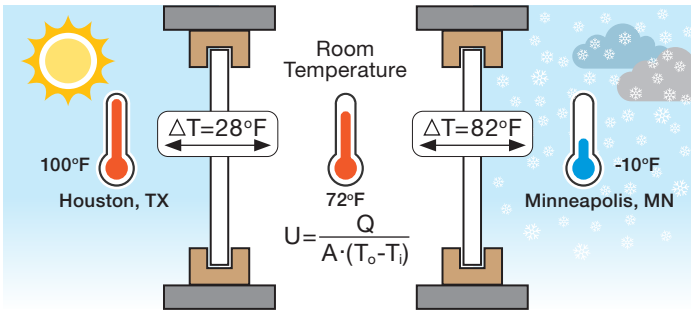
WINDOWS 101: EPISODE THREE FACT SHEET

Windows for Colder Climates

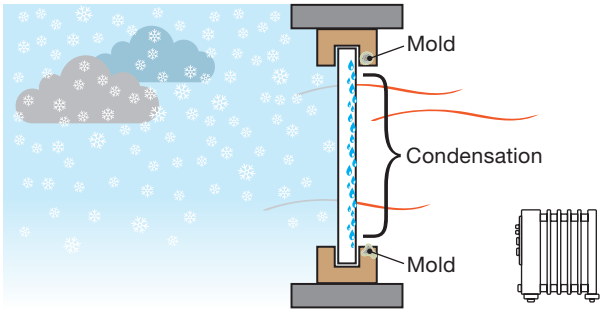
1 In the world of windows, the **U-FACTOR** is a measure of how well a window insulates. The lower the U-factor, the better the window is at keeping your house warm when it's cold outside, or cool when it's hot outside.



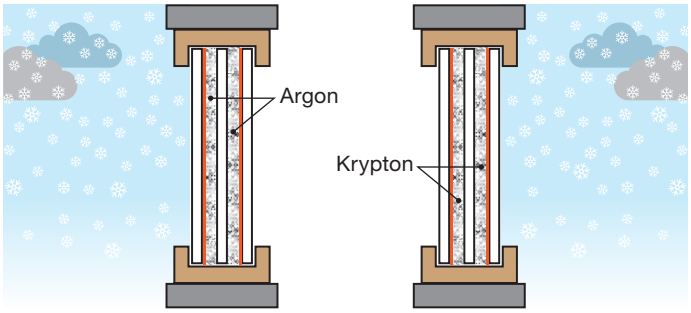
2 **LOW U-FACTOR WINDOWS** are especially important in cold climates because the indoor to outdoor temperature difference in cold climates is usually much higher than in warm climates.



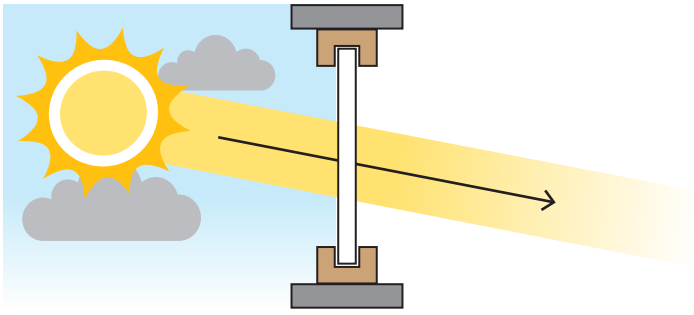
3 Poorly insulating, or **HIGH U-FACTOR WINDOWS**, waste energy, but can also contribute to other more serious problems like **CONDENSATION** — which usually occurs in the winter when cold outdoor temperatures cool the roomside window surfaces below the dewpoint of the warmer room air.



4 The latest high-performance window technologies all but eliminate the risk of interior condensation and show significant energy savings in cold climates due to their low U-factors. **TRIPLE-PANE WINDOWS WITH LOW-E COATINGS** in each cavity and lower conductivity gas-fills perform very well in colder climates.

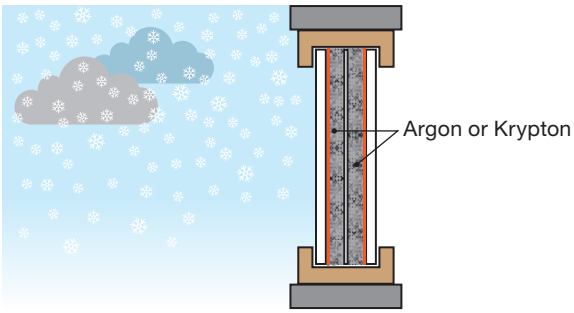


5 Transmitted solar radiation through a window is referred to as **PASSIVE SOLAR GAIN**, and during winter months, passive solar gain can offset heating demands from other sources. Lower solar altitude angles in the winter generally mean **HIGHER SOLAR INTENSITY** on a window, potentially admitting hundreds of watts of free heating into the space, on a cold but sunny day.

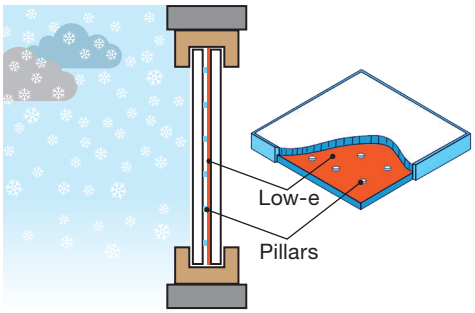


Learn more about windows at windows.lbl.gov/outreach

6 There are **EMERGING TECHNOLOGIES** such as thin-glass triple-pane and vacuum insulating glazing that can achieve low U-factors in a thinner space than traditional triple pane windows.



THIN-GLASS TRIPLES can use a center layer of glass as thin as 1mm. Combined with Argon or Krypton gas fills, thin-glass triples can achieve much lower U-factors than double-pane while still utilizing existing frames designed for double glazing.



VIG CAN BE RETROFITTED into frames designed for single-pane glazing, and can also be assembled into hybrid units for retrofitting into frames designed for double-glazing.

VACUUM INSULATING GLAZING (VIG), is the most insulating glazing technology on the market today. This emerging technology consists of two glass layers separated by a vacuum and an array of tiny pillars. The vacuum, combined with a low-e coating, nearly eliminates all heat transfer across the glazing.

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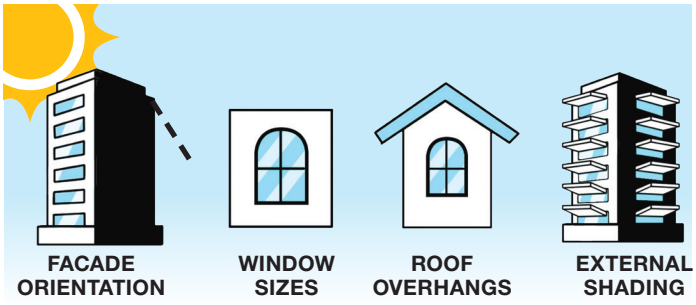
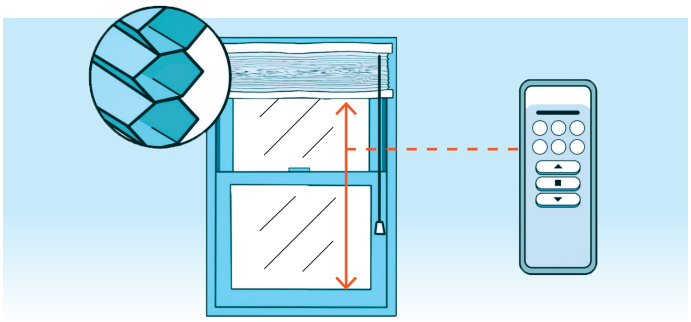
7 **BUILDING DESIGN** can have a significant impact on energy use associated with windows by leveraging the benefits of **PASSIVE SOLAR GAIN**. Facade orientation, window size (vision area), roof overhangs and other external shading such as trees and neighboring buildings can be utilized to offset heating demands from other sources.



8 **INSULATING SHADES** can be added to windows to decrease energy loss at night or in cloudy conditions when passive solar gain is not possible. Cellular shades with side tracks are one example of a highly insulating window attachment.



At Berkeley Lab, we are working on many many ways to reduce energy use associated with windows, check out our latest research at windows.lbl.gov. If you have ideas, we would love to hear from you.

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