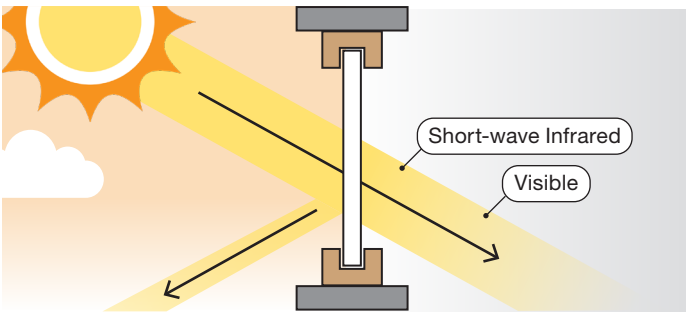


WINDOWS 101: EPISODE FOUR FACT SHEET

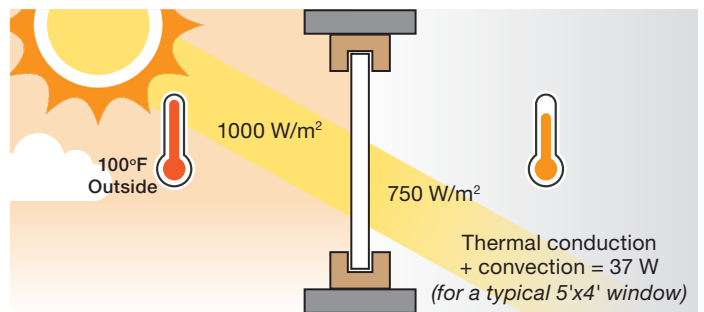
# Windows for Hot Climates

Controlling the transmission of solar energy through windows is particularly important to building energy consumption in hot climates.

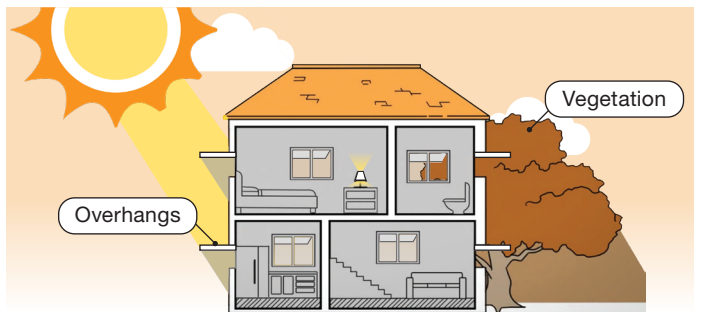
**1** Windows can admit a significant amount of energy to the building in the form of both **SHORT-WAVE INFRARED** and **VISIBLE** light.



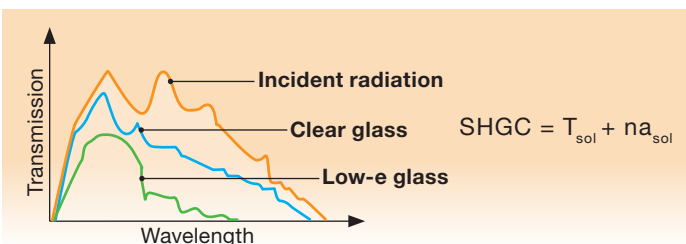
**2** When the sun is near normal incidence to a window, the **SOLAR RADIATION** can approach  $1000 \text{ W/m}^2$ , three-quarters of which would be transmitted into a building with single-pane or double-pane clear windows.



**3 BUILDING DESIGN** can help mitigate energy use due to solar gains through windows. The most effective method is to block incident sunlight before it even reaches the window, such as with exterior shading. However, there are many instances where it is difficult to control solar gain with external approaches alone, such as east and west facing facades where the sun is often low in the sky.

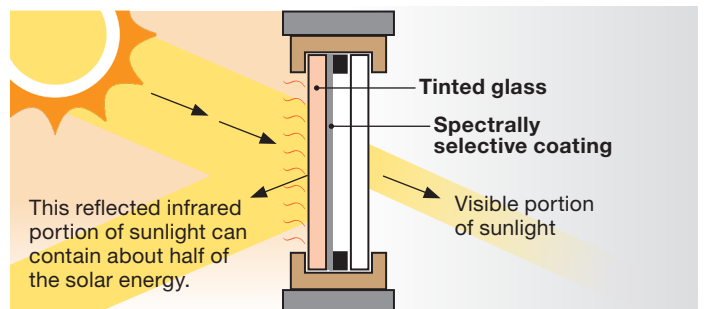


**4 SPECTRALLY SELECTIVE GLASS COATINGS** can control a large fraction of solar gain while maintaining clear views. These coatings strongly reflect the sun's energy in the areas we can't see, outside of the visible spectrum. Spectrally selective properties will result in windows that have a higher visible transmittance than solar heat gain coefficient (SHGC).

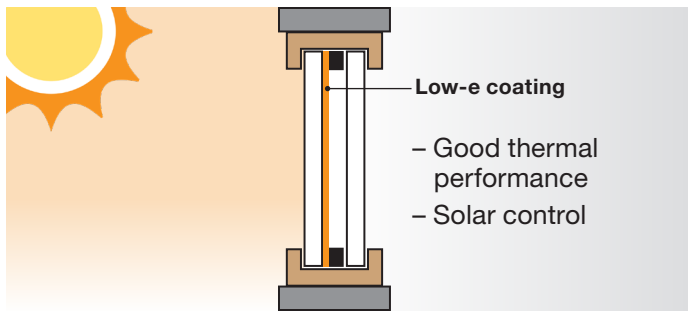


The best products on the market today can achieve a 2:1 ratio of these properties.

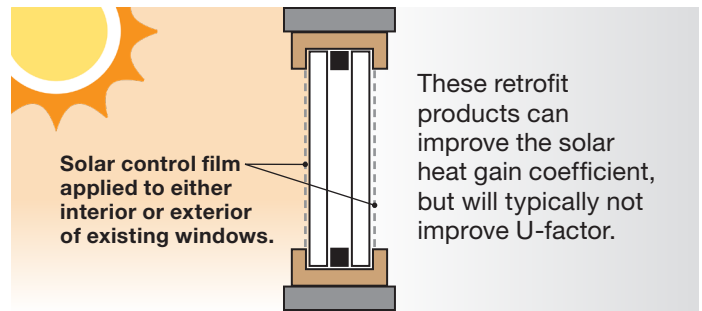
**5** To minimize the inward flowing fraction of solar heat gain, spectrally selective and tinted absorbing layers should be located **AS CLOSE TO THE EXTERIOR OF THE WINDOW** as possible. This allows a larger fraction of absorbed energy to be dissipated to the exterior rather than to the room.



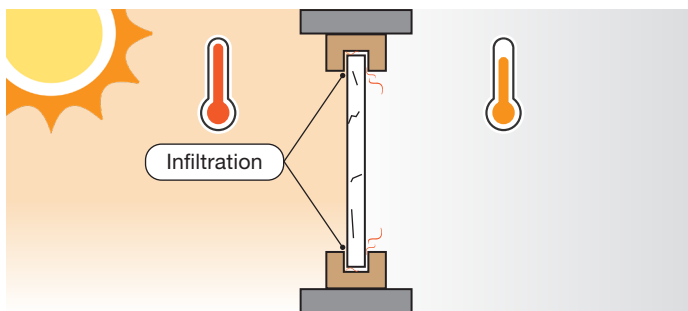
**6** In new **DOUBLE-PANE LOW-E WINDOWS**, the spectrally selective properties provide solar control in addition to the low-e's good thermal performance.



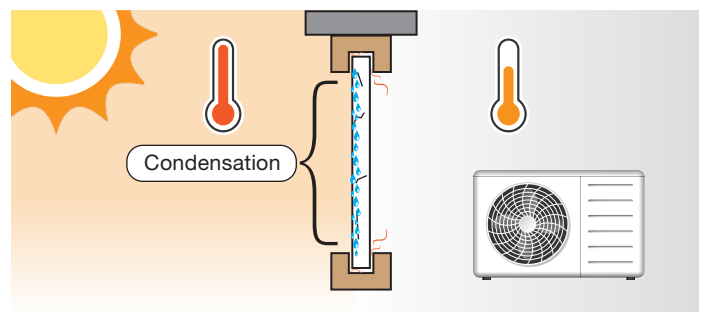
**7** Solar control can also be achieved with **SPECTRALLY SELECTIVE FILMS** applied as a **RETROFIT** to the interior or exterior of existing windows.



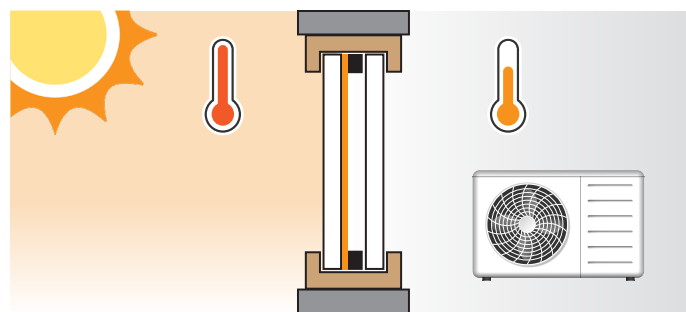
**8** In hot and humid climates, a significant portion of the cooling load is associated with **DEHUMIDIFICATION**. Minimizing air infiltration through windows in hot and humid climates is important in order to lower the thermal and latent load on the building.



**9** In a hot and humid climate, it is also possible to have **EXTERIOR CONDENSATION** on windows when the glass and frame are poorly insulating and the interior is air conditioned. A poorly insulating window system can bring the exterior surfaces of the window below the dewpoint of the warm and moist exterior air.



**10** The better the window components **INSULATE**, or the lower the U-factor, the closer the exterior surfaces will be to external air temperature, lowering the likelihood of this type of condensation.



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](http://windows.lbl.gov). If you have ideas, we would love to hear from you.



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