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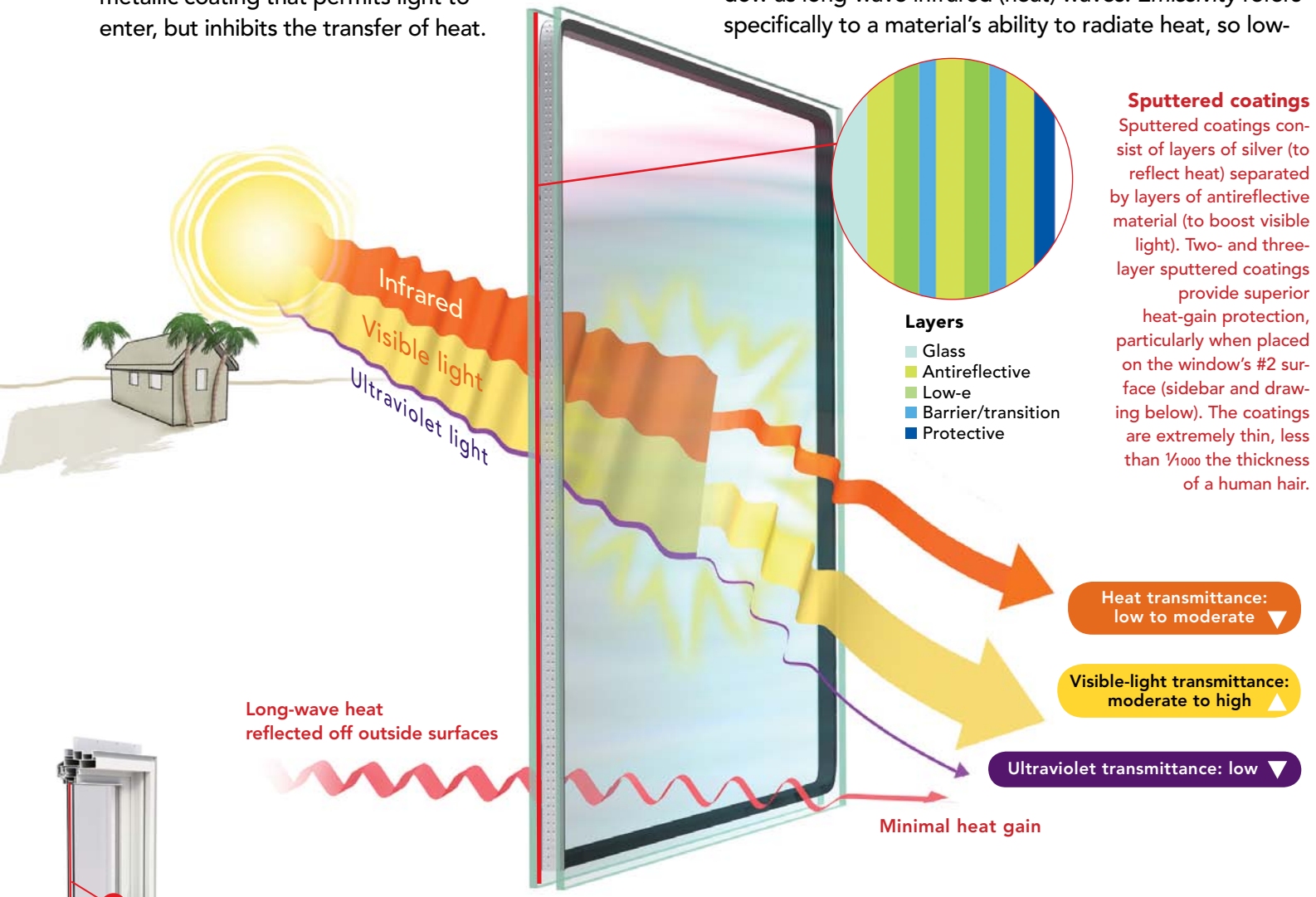
THE MECHANICS OF HOME BUILDING

BY DEBRA JUDGE SILBER

Low-e glass

Since it arrived on the scene in the 1980s, low-e, or low-emissivity, glass has been the go-to glazing for energy-efficient windows. Typically used in insulated-glass units (IGUs), low-e glass has a very thin, transparent metallic coating that permits light to enter, but inhibits the transfer of heat.

The sunlight that hits windows consists of ultraviolet, visible-light, and infrared waves. When infrared waves strike a window, some are reflected, some pass through, and some are absorbed and reradiated through the window as long-wave infrared (heat) waves. *Emissivity* refers specifically to a material's ability to radiate heat, so low-

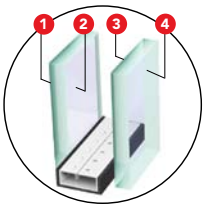


Sputtered coatings

Sputtered coatings consist of layers of silver (to reflect heat) separated by layers of antireflective material (to boost visible light). Two- and three-layer sputtered coatings provide superior heat-gain protection, particularly when placed on the window's #2 surface (sidebar and drawing below). The coatings are extremely thin, less than 1/1000 the thickness of a human hair.

Low-e glass for solar control

Windows designed to emphasize solar-heat control often have a low-e coating applied to what is known in the industry as the #2 surface (photo left, drawing right). Here, it reduces solar-heat radiation before it enters the window unit and is reradiated into the house. This results in a lower solar heat-gain coefficient (SHGC).



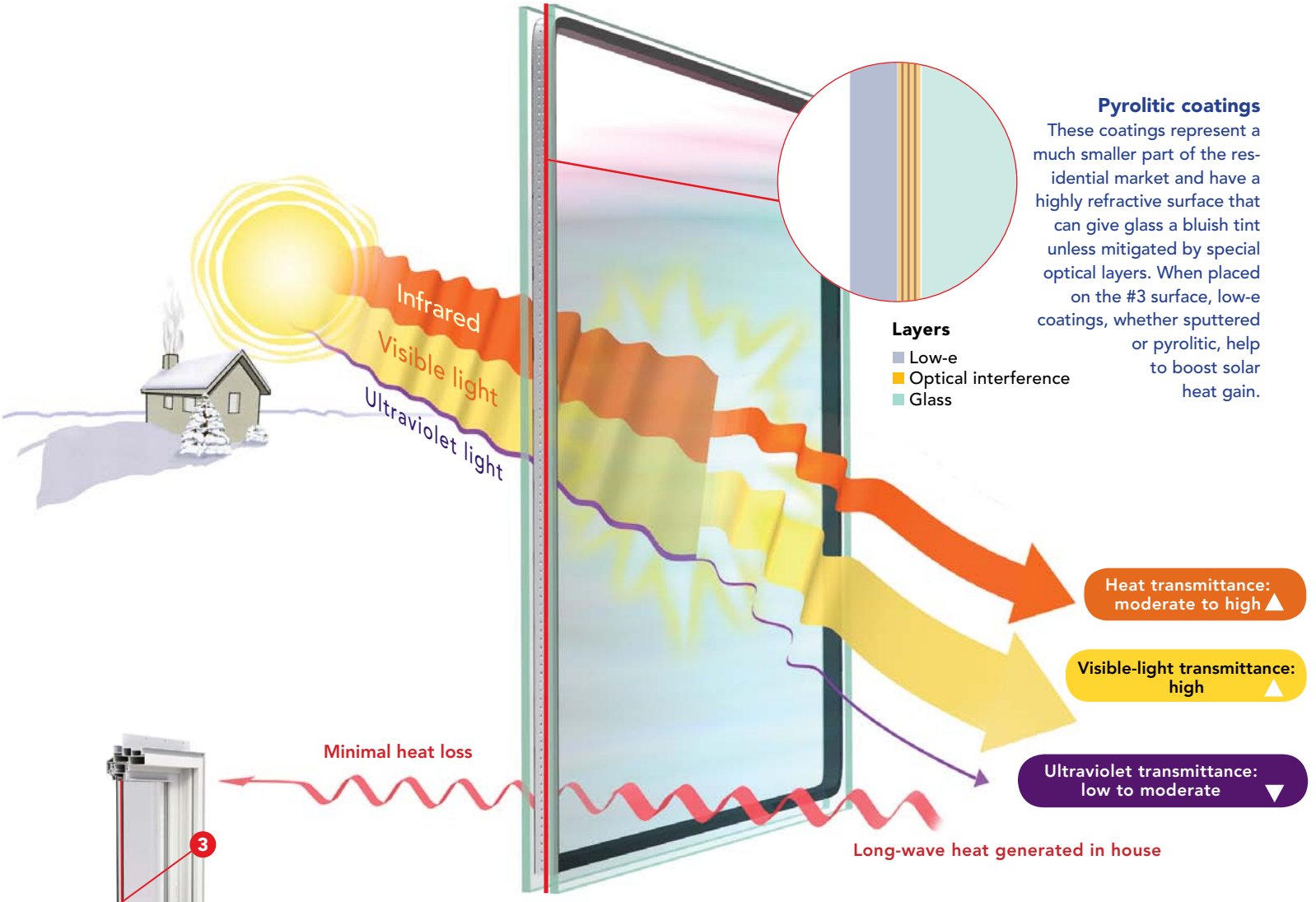
Because they are more effective in blocking solar gain, MSVD (magnetron sputter vacuum deposition) coatings, also known as sputtered coatings, are used in most solar-control windows. These "soft" coatings consist of one to three layers of silver deposited on the surface of the glass after it has been manufactured. Because they're fragile, these coatings are typically confined to the inside surfaces of multipane window units.

Drawings: Toby Welles, WowHouse. Photos: courtesy of Harvey Windows.

emissivity glazing is glazing that isn't good at absorbing and emitting the infrared (heat) energy that strikes it.

Emissivity, however, is only part of the picture. Different types of low-e coatings let in different amounts of UV-rays, infrared-heat rays, and visible light. What manufacturers strive for is glass that blocks most UV-rays, admits maximum light, and manages heat from infrared rays in a way that's most advantageous to the home's climate and orientation. Typically, windows that excel at rejecting solar heat (those with a low solar heat-gain coefficient, or SHGC) are recommended for hot climates, while windows that allow some solar gain (to aid in passive heating) are the customary choice in cold regions. Window orientation is also a factor, however. A north-facing window in a cold-climate home is unlikely to provide much solar gain in winter, when it is most needed; likewise, even in a southern climate, a south-facing window may provide some useful heat gain in cooler months, as long as summertime gain is mitigated by shading or other means. By varying the formula of the low-e coating and its placement on the IGU, manufacturers can tweak performance to suit a variety of situations. Here's how it works.

Debra Judge Silber is managing editor.



Low-e glass for passive solar gain

Where solar gain is desired, windows can be designed to block interior heat transfer while allowing more of the sun's rays to pass through. Typically, the low-e coating on these windows is applied to the #3 surface (photo left). Here, it maximizes the amount of solar heat waves entering the window while also preventing radiant-heat energy inside the house from escaping outside. Because they block fewer solar rays, pyrolitic ("hard") coatings are often used in passive low-e glass. Pyrolitic coatings consist of a layer of tin oxide that is applied to the glass during manufacturing using a chemical vapor-deposition (CVD) process. Because the coating becomes part of the glass, it is more durable and can be used on the exterior surfaces of insulated-window units. Single-layer sputtered coatings, applied to the #3 surface, also are used in passive solar windows.