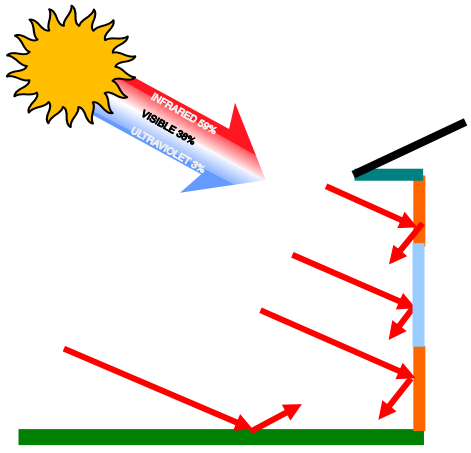
Design Considerations with Low-E Coated Glass

Increasing numbers of windows used in new homes and remodeling include insulating glass units that incorporate low emissivity (Low-e) coatings as a means of conserving energy. Low-e coatings such as PPG Sungate® and Solarban® coated glass help to conserve energy by reducing both the U-Value and the Solar Heat Gain Coefficient of the insulating glass unit. The use of these energy conserving products is mandated, in many cases, by building and energy codes and are an essential component of windows that meet the requirements of the DOE/EPA Energy Star® program.

Building materials, such as aluminum and copper flashing, brass kickplates on exterior doors, coated and non-coated glass products, aluminum or vinyl siding and painted wood, to name a few, can and do reflect solar energy onto adjacent materials. The ultraviolet rays and heat from the sun affects the service life of many of the materials used in the construction industry. Design professionals and builders should evaluate the service life and performance of the various materials, variations in grades of materials, installation recommendations, and potential interactions among the materials components in order to create designs that do not cause one product or material to compromise the performance of another product or material.

Low emissivity coated glass achieves its superior energy conserving performance in two ways. First the low emissivity of the coating reduces the radiated heat loss from the interior of the building; this reduces the required heating energy and associated costs. Second the coating is more absorbing and reflecting of the incident solar energy, thus reducing the solar heat gain within the building; this reduces the required cooling energy and associated costs. There are a variety of low-e coatings available in the market – some are designed to focus on reducing heat loads; others focus on solar control, i.e., reducing cooling loads. And some are good at doing both.

Low-e coatings designed to provide solar control do so by absorbing and/or reflecting a greater portion of the incident solar energy. The reflected solar energy is, of course, reflected to the surroundings, including adjacent walls where this reflected energy is, again, transmitted, absorbed or reflected. In the case of opaque building materials, such as wood, vinyl and brick, there is no transmittance, so the energy is reflected and absorbed in differing amounts, dependent on the material properties. The purpose of the following sketch is to illustrate that solar energy is reflected by all building materials and the surroundings.



Adjacent materials may receive some or all of the reflected solar energy, resulting – for example - in a temperature increase. The amount of temperature increase is dependent on a number of variables, including material properties, solar intensity, and outdoor temperature and wind conditions.
It must be remembered that all materials have some level of reflectivity. If the glass above were aluminum siding, vinyl siding or painted wood, some amount of solar energy would be reflected.

It should also be remembered that not all of the reflected energy is absorbed by the adjacent surface. If, for example, glass is reflecting solar energy onto an adjacent wall, the amount absorbed is dependent on the absorptance of the wall material. For example: If the glass reflects 40% of the incident energy and the wall has an absorptance of 20%, then the amount of solar energy reflected by the glass and absorbed by the wall will be 0.40(40%) x 0.20(20%) or 0.08(8%).

Taking a more specific example, if the material properties are as assumed above and the incident solar energy is 200 BTU/sq. ft./hr, then the additional solar energy absorbed by the adjacent wall would be:
0.40 x 200 x 0.20 or 16 BTU/sq. ft./hr.

With many building materials, the increased temperature due to this additional solar energy will have no impact. However, the increased temperature may have an effect on materials with higher coefficients of expansion and/or lower working temperatures. In addition, normal prolonged exposure to these temperature variations and ultraviolet radiation can cause some common construction materials to deteriorate over time.

It is the responsibility of the designer/builder to assess the relative quality of materials used and to specify that accepted good installation practices be followed.

More information about Low-e coated glass can be found at:

http://educationcenter.ppg.com/

HISTORY TABLE		
ITEM	DATE	DESCRIPTION
Original Publication	02/05/2003	TD-131
Revision 1	10/09/2015	Included all products and added website link.