NSG GROUP

Technical Bulletin

ATS-138
2013-01-14

How Pilkington **Energy Advantage**™ Low-E Glass Works

This Low-E coated glass works in two ways: First, it easily transmits (this is the "advantage" in the name "**Energy Advantage™**") the sun's energy because the coating is transparent to this range of radiation (0.35 to 2.50 micrometer); Second, the low-e coating has a greatly increased reflection to, and greatly reduced emission of, long-wave radiation (3 to 50 micrometer, also called Far Infra Red (IR)) compared to uncoated glass, which is opaque to long-wave IR radiation. Uncoated glass is highly absorptive and highly emissive at these far IR wavelengths.

A room at 70° F radiates energy in the far IR (maximum radiation at around 10 micrometers). Uncoated glass readily absorbs this energy. In winter the room-side surface of single glazing warms up. This heat then flows by conduction to the cooler outer surface where it radiates and convects (by contact with cool outside air) heat to the cold exterior in winter.

Low-E coatings (being also electrically conductive) reduce the transfer of long wave IR energy. Pilkington **Energy Advantage**™ Low-E Glass has a Fluorine doped conductive tin oxide coating.

If the Low-E coating is on the 3rd surface (the exterior side of the room-side light) of a two light insulating glass (IG) unit, it cuts the radiant heat loss to the cold exterior by reducing the radiation or emission, towards the exterior, of the energy absorbed within the room.

If the coating is on the 2nd surface of an IG unit, it insulates by reflecting the long wave IR, coming from surface #3, back towards the room. A coating such as Pilkington **Energy Advantage**™ Low-E Glass with an emittance of 0.15, has an IR reflection efficiency of 85%, as compared to uncoated glass with only 16% IR reflection.

The thermal insulation effects of the coating on either #2 or #3 surfaces are identical for winter nighttime heat loss. The two equal U-Factors (thermal conductivity) show this fact.

It should be noted that heat flows from hot to cold objects. The sun is hot and so its radiant energy enters a room in both summer and winter. The SHGC value measures this amount. In winter this absorbed solar energy then tries to transfer back out towards the cooler exterior. Plain glass has poor insulation and so creates high heating fuel charges. Low-E coated glass reduces this heat loss. In summer, when it is hot outside, a small amount of unwanted heat does come into a room in by conduction. Low-e glass, with its reduced U-Factor, will reduce this undesired radiation heat gain.

Pilkington North America, Inc.

811 Madison Avenue, Toledo, Ohio 43604-5684

Telephone 800 221 0444 Fax 419 247 451

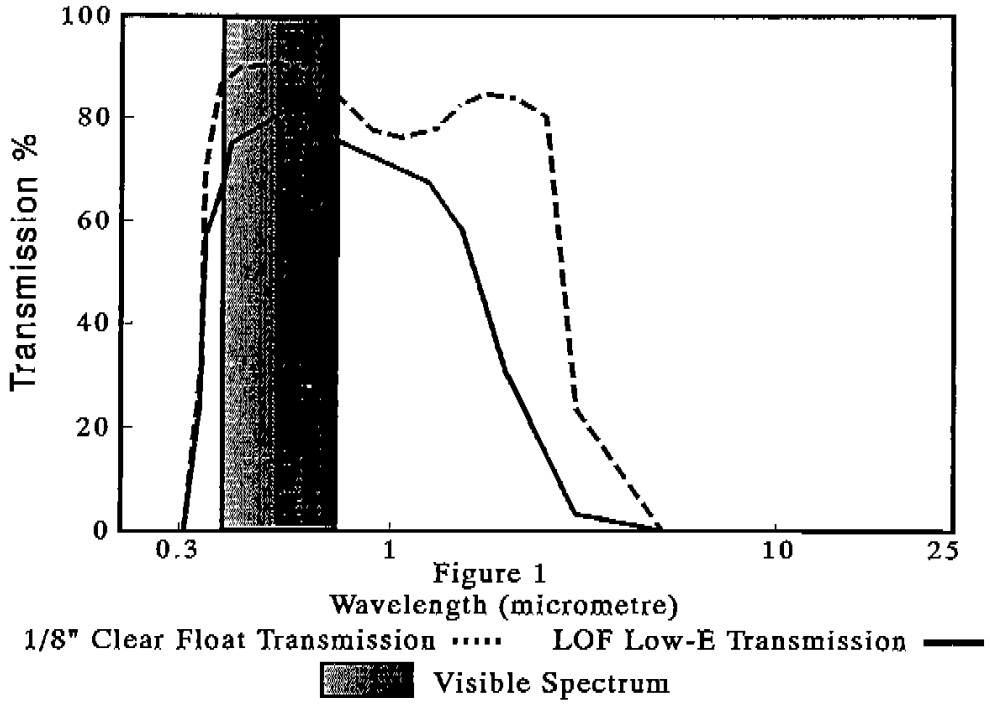

Figure 1

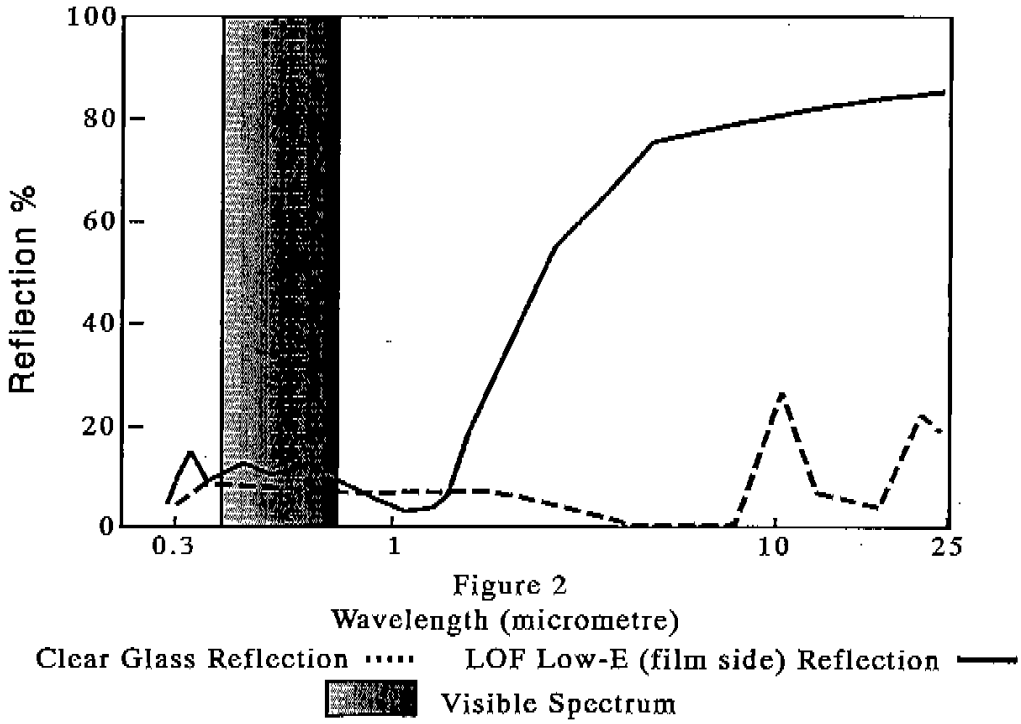

Figure 2

Pilkington North America, Inc.
811 Madison Avenue, Toledo, Ohio 43604-5684
Telephone 800 221 0444 Fax 419 247 4517

Finally, the much-quoted greenhouse effect should be carefully understood: A greenhouse with uncoated clear glass gets warm because the absorbed solar radiation within the enclosed space is prevented from escaping to the exterior environment by the presence of the glass which blocks air convection currents. (The radiant heat transfer from the warmed material in the greenhouse to the cool exterior is little altered by the presence of a single light of clear glass.) The use of a Low-e coated glass in a greenhouse creates warmer temperatures within because the radiant heat loss of the absorbed passive solar gain is reduced.

Note: Pilkington **Energy Advantage**™ Low-E Glass has high solar gain (High SHGC). It does not admit as much solar gain as uncoated clear glass. But there are other Low-E coatings which have low solar gain (Low SHGC). They reduce solar gain by reflecting and/or absorbing solar IR energy. Their performances can be compared by noting their SHGC values. Both High and Low SHGC Low-E coatings have similar night time insulation (U-Factor) values.

Pilkington North America, Inc.

811 Madison Avenue, Toledo, Ohio 43604-5684

Telephone 800 221 0444 Fax 419 247 4517