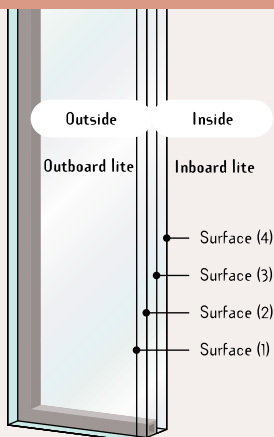


Single glazing is a poor insulator. In warm climates single glazed clear glass will let through a major proportion of the sun's energy making the room hotter. Having windows exposed to direct solar energy will increase cooling costs. In colder climates the warmth that may be generated in a room quickly transfers to the colder outside, increasing heating costs. Products with a low emissivity, or low-E coating, such as PPG's Sungate® were specifically designed to reduce heat transfer in warmer and colder climates and reduce energy costs. Low-E glass works most efficiently in insulated glass units. This product is generally non-reflective and highly transparent. (eg., 77% visible light transmittance for PPG Sungate® 500.)

SURFACE POSITIONS FOR IGU'S



THE 'E' IN LOW-E

The 'E' in low-E refers to emissivity. Emissivity is a measure of a material's ability to radiate energy. A material with 'low' emissivity absorbs and radiates infrared energy poorly which is the key factor in reducing heat transfer. The lower the emissivity of a coating the better the glass performs in reducing heat transfer.

HOW DOES LOW-E GLASS WORK ?

A basic understanding of how low-E glass works, involves a closer look at the sun's energy and the solar spectrum.

The sun's energy can be divided into different components such as (1) ultraviolet light; (2) visible light; (3) infrared energy.

High levels of ULTRAVIOLET LIGHT can be harmful to humans and damage and fade furnishings. The desire is to exclude all of this component.

VISIBLE LIGHT is the desirable component giving us natural daylight, the cheapest source of lighting available (of course we may want to control glare).

The INFRARED ENERGY component may be both desirable and undesirable. It is desirable when we seek sunshine and warmth for personal comfort and to naturally heat a room's interior (passive solar heat gain/heating). It is undesirable when it becomes discomforting, where the room becomes hot and strains are placed on people and air-conditioning systems.

The infrared part of the spectrum (or what we feel as heat) consists of varying wavelengths. Short wave infrared heat energy is absorbed in the interior of the building by carpets, curtains, furniture, walls etc., and is changed into long wave infrared heat. Objects outside the building also absorb short wave energy and are changed into long wave heat energy. The special coating on Sungate 500 low-E glass reflects long wave heat radiation back into the room in winter conditions and for summer conditions reflects heat back outside.

Low-E glass selectively allows specific portions of the sun's energy or the 'desirable' wavelength components to be transmitted. When combined with spectrally selective tinted glass such as Azurlite and Solargreen, low-E glass offers the ideal glazing solutions of low ultraviolet and high visible light transmittance, low shading co-efficient or solar gain and high insulation or 'U'- values. This translates to a greater control of the internal environment, greater occupant comfort and lower heating and cooling costs.

FEATURES AND APPLICATIONS

- helps reduce summer heat gain and winter heat loss;
- reduces ultra-violet substantially;
- improves occupant comfort, reduces condensation build up;
- coating is transparent, non reflective and durable (hard coat);
- best performance achieved in double glazed units (IGU's);
- available in 3, 4 and 6mm annealed, toughened and can be laminated.

DID YOU KNOW?

- performance of this product is best achieved with IGU's;
- climate condition determines position of coated surface in glazing (refer text);
- coatings may effect the colour of the glass. Samples should be viewed;
- TOUGHENING OR HEAT STRENGTHENING WILL PREVENT THERMAL BREAKAGE;
- for more information on the thermal safety of Annealed glass, refer "Thermal Breakage" on page 22.

SUNGATE® 500

Pyrolytic (hard coat) coated glass such as SUNGATE® 500 are produced at the molten stage of float glass manufacture, where a tin oxide coating with additives is applied to the glass. Upon cooling, this coating is fused into the body of the glass. The surface produced is as durable as normal glass in terms of cutting, processing and installation. The glass can be heat strengthened, toughened or laminated like normal float glass.

WHICH IS THE BEST SURFACE FOR THE LOW-E?

Low-E glass is best utilised in double glazed units or IGU's, though laminated and monolithic applications are possible with some interesting results (refer text). The surface position (#) on which the low-E glass will be placed is dependent on the climate.

Ideally for warm climates where summer heat reduction is a priority, the coating should be on surface (2) for maximum performance. The coating on surface (2) minimises heat gain because it reduces heat build up in the air gap and heat transfer to the interior. This coating should always be directly applied to a tinted glass as a soft coat application. The coating in this situation works in conjunction with the tinted glass to reduce heat gain. In these situations the substrate glass should be heat strengthened or toughened to avoid thermal breakage. Using surface (3) low-E or coating placement such as PPG's Sungate 500, where cost is a major consideration, is effective for warm climate glazing with only marginal decreases in U-value and a higher shading co-efficient when compared to surface (2) coatings.

In cold climates where retention of heat is a priority, the low-E coating or panel glazed surface (3) is recommended.

In these situations we are relying on the effects of passive solar heat gain to naturally heat the building's interior and the low-E coating to reflect any of the re-radiated heat back into the room.

LAMINATED AND SINGLE GLAZED (MONOLITHIC) LOW-E*

For LAMINATED glass, low-E coatings on surface position (2) or (3) do not produce any improvement in U-Value. The only improvement can be obtained with the coating on surface(4) where it interacts directly with long wave radiation. With this make-up, a 30% U-Value improvement is possible over clear single glazing. The shading coefficient can also be improved by up to 25% with the coating on surfaces (2), (3) or (4). However, the low-E glass used would have to be a hard coat such as Sungate 500 as current technology restricts the use of a soft coated product due to durability problems when exposed to the outside air and compatibility problems when laminated. In an IGU or double glazed unit, laminated glass could be utilised on either outboard or inboard lites with coatings on either surface(2) or (3).

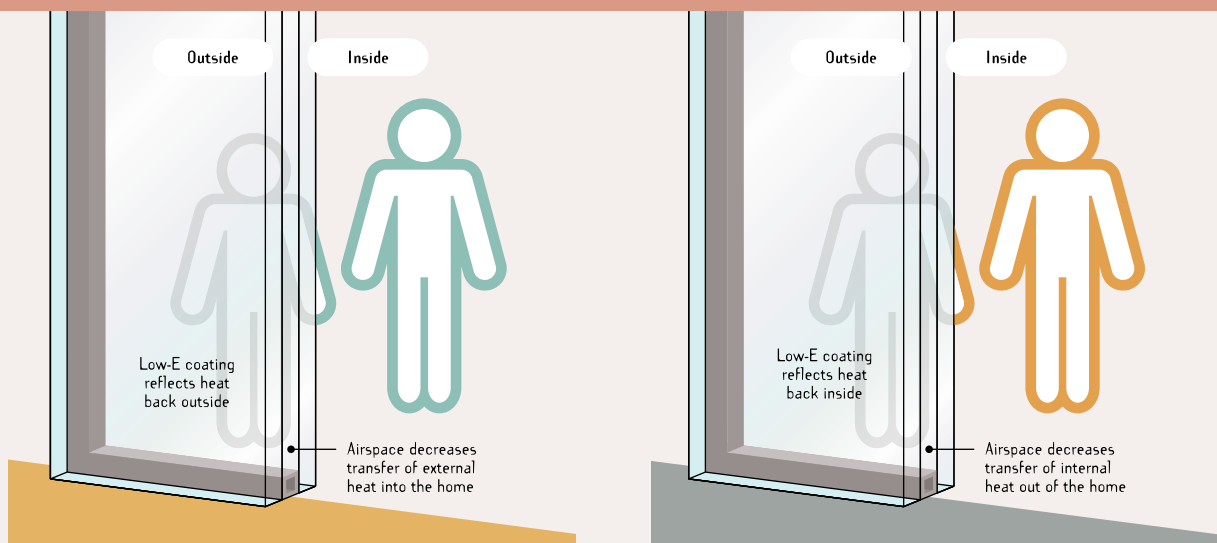
With SINGLE GLAZING OR MONOLITHIC, the U-Value improves by 35% with the coating on surface position(2) while shading co-efficient improves by 12% over clear single glazing. Again current technology allows only a hard coat product such as Sungate 500 to be used.

COMMON LOW-E TRADE NAMES

- ClevoCoat - China Southern
-
- Comfort E - AFG/AFGD
-
- Ekoplus - St Gobain
4mm and 6mm hard coats.
- Energy Advantage Low E - LOF
-
- K-Glass - Pilkington
Hard coat.
- Sungate - PPG
Range of 3, 4 and 6mm hard coats and soft coats.

* Data and information from PPG December 1994 monolithic Sungate 500 glass performance test paper. Tests conducted in cooling dominated region of Phoenix, Arizona USA.

LOW-E GLASS AND INSULATED GLASS UNITS



Low-E glass IGU - Summer climate

Less external heat is transmitted into the home resulting in greater comfort and reduced air conditioning costs.

Low-E glass IGU - Winter climate

Internal heat is retained resulting in greater comfort and reduced heating costs. Also reduces condensation.