ENERGY-EFFICIENT GLAZING

GLAZING GLOSSARY

Coated
Glass may be coated “on-line” or “off-line” (independent of the manufacturing process). On-line coatings are called “pyrolytic” and, because of their high durability, can be further processed (cut, toughened, curved etc.). Off-line coated products are often referred to as “sputtered” coatings and some of these coatings need to be protected within a double-glazed unit or a laminate. Once manufactured, off-line coated products are generally not suitable for further processing other than cutting.

Double-Glazed Unit or Insulated Glass Unit (IGU)
A double-glazed unit or IGU is comprised of two panes of glass separated by a cavity containing air (or another gas) and hermetically sealed. An IGU provides thermal insulation and improved acoustic performance. An IGU is described in terms of the thickness of the outer pane in millimetres, followed by the gap width between the panes and finally the thickness of the internal pane (e.g. 4/12/4). The greater the gap width (towards about 20 mm), the better the insulation performance. The inclusion of an inert gas such as argon instead of air and the specification of Low E glass further improves the insulation provided by the IGU.

Laminated
Laminated glass panes are assembled from two sheets of glass sandwiching an interlayer, which bonds the glass (usually PVB). A heavy impact can break laminated glass, but won’t splinter it. This leads to greater safety and security. Laminated glass eliminates nearly 99% of harmful UV rays, greatly slowing the fading of floors and furniture. A specialized interlayer in laminated glass can further reduce the Solar Heat Gain Coefficient.

Light Transmittance, Visible Transmittance (VT)
VT refers to the proportion of the visible spectrum that is transmitted through the glass.

Low E
Low E is a coating that is deposited on a glass surface to enable it to reflect short wave (direct solar) heat or long wave (re-radiated/ reflected) heat.

Reflective Coating
To create a reflective coating, a metallic coating is applied to one side of the glass in order to significantly increase the amount of reflected visible and infra red heat.

Solar Control Glass
Solar control glass is glass that reduces heat gain derived from direct solar radiation. This may be achieved via interlayers, body tints, reflective coatings or Low E coatings.

Solar Heat Gain Coefficient (SHGC)
The SHGC is the ratio of solar heat admitted by the glazing into a building, compared with the energy striking the outside surface of the glazing. It includes directly-transmitted radiation plus indirect heat gain from re-radiation and convection of absorbed heat from the glass into the building. The lower the number, the higher the performance.

Toned/Tinted
Toned/tinted glass is usually green, grey, bronze or blue. It can shade internal areas and reduce the amount of heat entering through the window. This will keep the building cooler and reduce glare and UV rays.

U-Value
The U-value indicates the rate of heat flow through a window due to a temperature difference, from inside to outside (in winter) or from outside to inside (in summer). Heat is lost and gained through a window by the combined effects of conduction, convection and radiation. The lower the number, the higher the thermal performance.

BENEFITS OF ENERGY-EFFICIENT GLASS

Energy-efficient glass in windows can achieve:
- an energy-efficient building envelope
- greater design freedom
- greatly reduced greenhouse gas emissions
- reduced reliance on orientation
- enhanced thermal comfort up to 5°C warmer in winter and 10°C cooler in summer
- improved security
- a substantial reduction in condensation with the installation of double glazing
- improved acoustic performance
- reduced energy costs to heat and cool – a saving of approximately 40% to heat and cool the building
- reduced fading of furniture and fittings
- a better environment for the future
SELECTING GLASS FOR HEAT RETENTION

How buildings lose heat: 14% walls, 18% floor, 19% roof and 49% glazing.

These figures are based on actual case studies of an otherwise insulated building. Individual building performance may vary depending upon design and location.

Residential windows in Australia typically perform very poorly in terms of energy efficiency. Heat escapes easily through standard 3 mm glazing. An unprotected single pane of ordinary glass loses almost ten times more heat than the same area of insulated wall.

If all Australian homes were glazed correctly, greenhouse gas emissions would be reduced by approximately 8 million tonnes per annum.

A significant saving of 40% off energy bills to heat and cool all residential and commercial buildings can be made if appropriate glazing is installed. Installing energy-efficient glazing into windows adds as little as 1% to the initial cost of building.

Below are some glazing options for heat retention.

Low E Double Glazing
The use of a Low E double-glazed unit in your window can stop up to 70% of heat loss.* Select glazing with a U-value in the range of 2.7 – 1.8 W/m²K.

Double Glazing
The use of a double-glazed unit in your window can stop up to 55% of heat loss.* Select glazing with a U-value in the range of 3.2 – 2.7 W/m²K.

Single-Glazed Pyrolytic Low E Glass
The use of single glazed pyrolytic Low E glass in your window can stop up to 39% of heat loss.* Select glazing with a U-value in the range of 4.2 – 3.6 W/m²K.

SELECTING GLASS FOR HEAT REJECTION

How buildings gain heat: (0% floor), 8% walls, 5% roof and 87% glazing.

These figures are based on actual case studies of an otherwise insulated building. Individual building performance may vary depending upon design and location.

Heat enters easily through ordinary glass, with standard 3 mm glazing offering little resistance. Close to 70% of new homes in Australia are now installing air-conditioning, so the energy consumption and costs to operate these cooling systems are soaring. In all climates, the installation of energy-efficient glazing will reduce or negate the need to install any artificial cooling systems, returning an environmental and economic advantage for the life of the building.

Below are some glazing options for heat rejection.

High-Performance Low E Double Glazing
The use of a high-performance Low E double-glazed unit in your window can stop up to 77% of solar heat gain.* Select glazing with a Solar Heat Gain Coefficient (SHGC) in the range of 0.4 – 0.2.

Single-Glazed High-Performance Tinted Low E Glass
The use of a single-glazed high-performance tinted Low E glass unit in your window can stop up to 57% of solar heat gain.* Select glazing with a SHGC in the range of 0.45 – 0.37.

Single-Glazed High-Performance Glass
The use of single-glazed high-performance glass in your window can stop up to 40% of solar heat gain.* Select glazing with a SHGC of 0.52 or lower.

Note: Hot climates demand glazing that can minimize solar heat gain, but which also protects the cool interior through insulation (U-value). Best results in hot climates derive from glazing that provides insulation for the interior and a low SHGC. Such properties are best gained from an IGU that has a solar control outer panel.

DETAILING FOR ENERGY-EFFICIENT GLAZING

Some critical elements to consider in the detailing of glazing for energy efficiency are as follows:

Width of Spacer in Double Glazing
A 6 mm space is adequate, but 12 mm to 16 mm maximizes the insulation of the unit. Typically, a 12 mm air gap is 10% better than a 6 mm gap.

Type of Glass in Window
Single-glazed tinted glass will lower the SHGC, but not the U-value. Low E on “surface #3” of an IGU will typically lower the U-value by up to 20%. In double glazing, the outside of the outer panel is surface #1, the inside of the outer panel is #2, the outward-facing side of the internal panel is #3, and the face that faces the interior of the room is #4. By having the Low E coating on #3 rather than #4, the impact on the U-value is maximized and the coating is protected from any potentially harmful cleaning. It can also better reflect some of the solar radiation that hits the window.

Gas Fill in Double Glazing
Using argon rather than air can improve the U-value by 2% to 3%.

Important Notice:
This information and advice provided is intended as a reference only. An energy-efficient design and construction depends upon numerous factors. The Australian Glass and Glazing Association accepts no responsibility for specifications in, nor work done or omitted to be done in reliance on this information. Whilst all care has been taken to ensure the accuracy of the information, the Australian Glass and Glazing Association disclaims, to the full extent permitted by law, all and any liability for any damage whether direct, indirect, special or consequential, arising directly or indirectly out of use of or reliance on this information, whether as a result of negligence or otherwise.

*The performance figures shown are based on heat gain through glass only. Data has been calculated using NFRC 100 – 2001 environmental conditions and Window 5.2 software from the Lawrence Berkeley National Laboratory (2006). Savings are in comparison to using 3 mm clear glass and may vary depending on actual operating conditions.

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