TechDirect

TECHNICAL BRIEFING - SUSTAINABILITY: GLASS SELECTION AND TERMINOLOGY

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Introduction
Glass is made from the world's most abundant material, sand. Viridian uses a high proportion of recycled glass content in its production, typically 15% in float glass, which assists to reduce energy consumption. Totally recyclable and using such a simple material source as sand belies the product advancements that have been developed recently. These are the incorporation of coatings for solar and thermal performance as well as specialist interlayers in laminated glass for noise, fire and human impact safety, and for variable light transmission. These advancements provide a range of products that can be tailored to specific project requirements.

Viridian was the first manufacturer to enter a Sustainability Covenant between EPA Victoria, Sustainability Victoria and Australian Industry Group to work together to protect the environment and to contribute to a more sustainable Victoria and Australia.

Glass plays a unique and important role in building design and the environment. It affects appearance, thermal performance and occupant comfort.
The selection of the right glass is a crucial component of the design process.

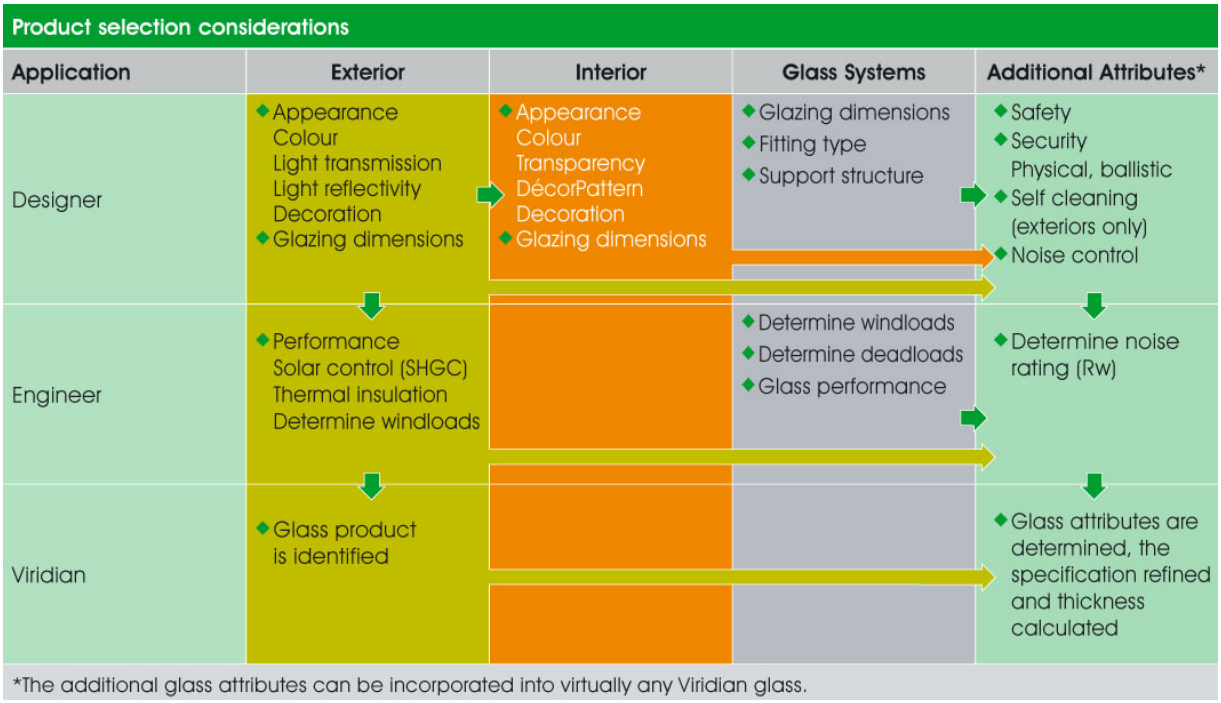
Key themes discussed in this paper:
- **Product selection considerations**
- **Performance data terminology**
- **Glass and energy management**

Product selection
Some of the key decisions that need to be made in the selection of glass in facades, interiors and glass systems are listed below. Solar and thermal performance will often be a high priority decision along with appearance (colour, transparency and reflectivity). This information can lead to a selection of glass product types with additional attributes such as safety, security, decoration, noise control and self-cleaning.

The chart below shows information required from designers and engineers to find the right glass product.

Once the appearance and functional requirements have been developed by the designer, the structural engineer will provide the loads and wind pressure, the mechanical engineer the thermal performance requirements and the acoustic consultant the acoustic requirements.

Viridian we ♥ glass



Other considerations

Glazing size and dimensions – by selecting a module that suits the glass maximum size or the processing equipment, (toughening, laminating or coating) economics can be made. Likewise minor modifications in glazing centres may enable a more economical thickness of glass to be used. For example, glass can resist greater loads as a square than a rectangle for the same thickness.
Thermal stress – some solar control glass requires the additional process of heat strengthening or toughening to prevent breakage from thermal temperature differentials. At an early design stage this additional cost can be reviewed and often avoided. It may be as simple as changing the frame colour.
Breakage and minimising risk - how glass behaves in the case of accidental or intentional breakage must be considered and while glazing codes and regulations provide the minimum requirements, they do not necessarily constitute fitness for purpose. Attention is drawn to the section in the Viridian Architectural Specifiers' Guide on the Heat Soak treatment of Viridian Toughened glass and the strength recommendations of glass in loading and glazing codes.

Performance data terminology

To describe the performance of glass, it is important to understand the following attributes:

- **Visible light transmittance** – the percentage of visible light (380 to 780nm) transmitted through the glass. The higher the number, the more light. It does not determine the colour of the glass.
- **SHGC (solar heat gain coefficient)** – the proportion of directly transmitted and absorbed solar energy that enters into the building's interior. The lower the number the better solar control. For example, if the direct solar energy on a hot day is 785 watts/m^2 and Viridian **SuperGrey™** was used with a SHGC of 0.35, then the solar energy reaching indoors is 785 x 0.35 = 275 watts. Approximately two thirds of the sun's heat is eliminated.
- **U Value** – this is the measurement of air-to-air thermal conductance, or insulation between indoors and outdoors, through the glass. The lower the number the better the insulation. For example, clear glass has a U Value of 5.8 W/m^{2o}C. If the indoor temperature was 24^{o}C and the external temperature 34^{o}C (a difference of 10^{o}C) then 10^{o}C multiplied by the U Value 5.8 equals 58 watts/m2 of heat that would be transferred between the exterior and interior.

Low Emissivity (Low E) glass

These glasses enhance insulation and provide additional solar control when combined with a solar control glass in either a single glass or insulating glass unit. Low E glass has either a pyrolytic or Airco coating that reduces the emissivity of the glass surface. This means the glass provides greater insulation by reflecting heat generated from air-conditioning and other sources back inside a building. For improved solar control it is also a second line of defence. Heat absorbed by the solar control glass is reflected back out by the low emissivity coating to provide

even better solar control. Low E coatings are useful for reducing solar heat gains and also heat loss. The low E coating used on Viridian **EnergyTech™** has virtually no change in colour or daylight transmission.

Performance comparison

To assist in comparing products, Viridian has developed a chart that shows the key performance selection criteria: daylight, solar control and insulation. The following example shows a comparison between Viridian **VFloat™** Clear, Viridian **SuperGreen™** and Viridian **EVantage™** SuperGreen.

The greater the shaded area the better performance. The number represents the actual value for:

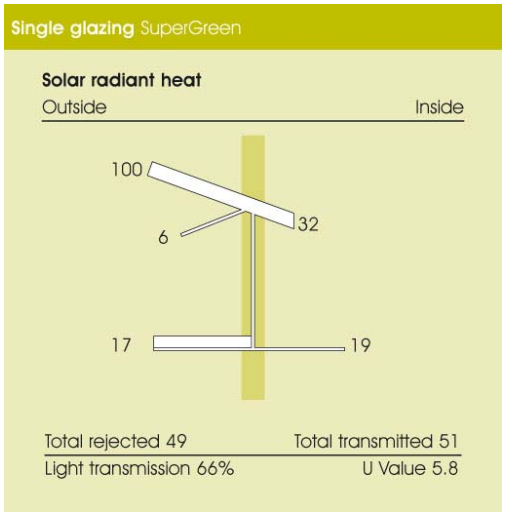
- **Daylight** = % transmission
- **Solar** = Solar heat gain coefficient
- **Insulation** = U Value

Performance comparison chart

Product*	Daylight	Solar	Insulation
VFloat Clear	87	0.81	5.8
SuperGreen	66	0.51	5.8
EVantage SuperGreen	48	0.36	3.8

*6mm glass thickness.

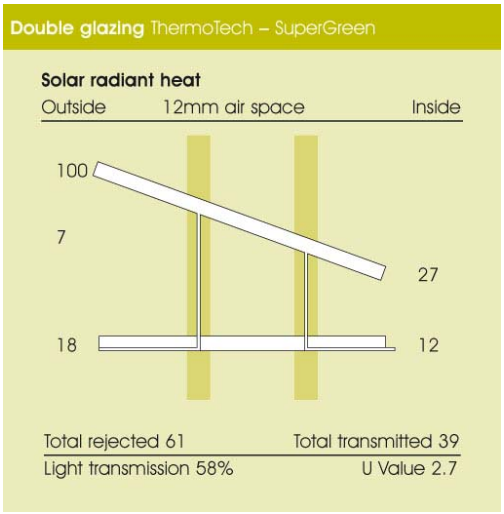
Glass and Energy Management



Viridian **SuperGreen™** reduces solar heat gain through a combination of reflection, transmission and absorption.

Glass controls solar heat gain through reflection and absorption. The total heat transmitted is calculated as the SHGC. By adding an additional glass and/or coating in the Viridian **ThermoTech™** example below, the SHGC is further reduced and the insulation increased (lower U Value).

High performance tones as well as the addition of a reflective coating such as Viridian **Enviroshield Reflective**™ increase the absorption of the glass. The addition of a low E coating assists with reducing the absorbed heat of radiation indoors and double-glazing increases the insulation.



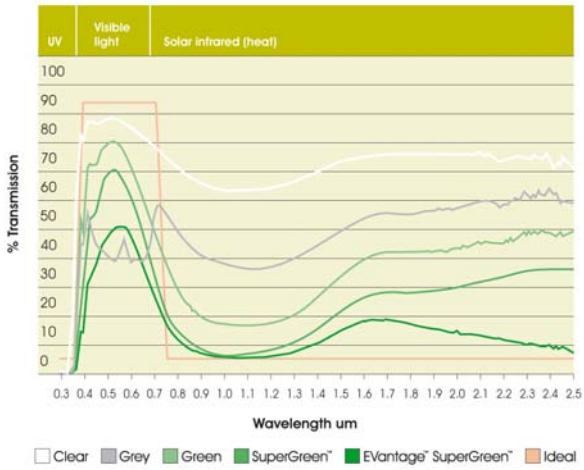
Shows how Viridian **ThermoTech™** with **SuperGreen™** (double-glazing) further reduces solar heat gain and provides better insulation while maintaining daylight transmission.

The full performance data of all Viridian products is shown in the Glass performance data and comparison charts. For full information refer to website or Viridian Architectural Glass Specifiers' Guide.

The solar energy spectrum and glass

The role of Viridian solar control glass is to minimise infrared light that carries most of the sun's solar energy while maximising visible light. The ideal spectrally selective glass would transmit daylight and eliminate infrared and UV light. The chart below compares some current Viridian products to the theoretical ideal glass.

Spectral curve comparison



The curves compare the percentage of solar energy spectrum transmitted.

Solar control products

Solar control – Products that mediate solar heat gain

- Viridian **VFloat™**
- High performance tones:
  Viridian **SuperGreen™**
  Viridian **SuperGrey™**
  Viridian **SuperBlue™**
- Viridian **EnviroShield Reflective™**

Solar control with low E –
Products that provide high solar control, with the added insulation of a low E coating

- Viridian **EVantage**™
- Viridian **SolTech**™
- Viridian **ComfortPlus**™

Thermal insulation –
Insulating glass units for cold and hot conditions

- Viridian **Thermotech**™

Further information
Please visit viridianglass.com or speak to your Viridian representative.

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