An MHG Company

Glass source

solos glass

see the possibilities

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Sound management

Unwanted noise is not only a nuisance, it had been directly linked to stress related illnesses, anxiety, irritability, hearing loss, sleep disruption, lost productivity, aggression and anti-social behaviour.

In an era of significant housing, workplace and infrastructure development, the issue of noise pollution and the need for its reduction has come increasingly to the forefront. Of particular interest and focus recently has been the need to reduce people's exposure to vehicle, train and aircraft noise in particular.

Aesthetic and performance attributes of glass has positioned it as the product of choice when it comes to either the building facade, residential windows, commercial windows or various types of internal space separation.

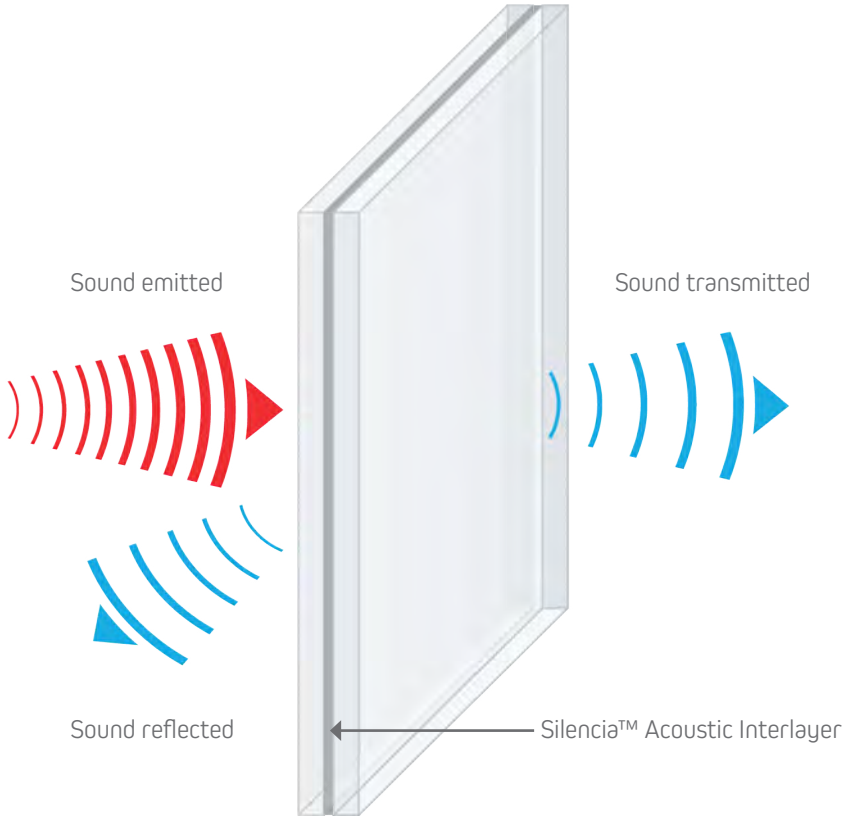
Transmission of noise into a room

Any glazing system is only as good as its weakest point and in order to achieve effective noise reduction, the glazing system has to be well sealed and fitted to minimise air leakage and sound transmission. However, the glass and glazing are only one building element within a room which needs to be considered when seeking an overall solution to noise reduction.

It is important to be aware of all potential noise entry points. For example, gaps between the roof and the ceiling, heating and air conditioning vents, spaces under the house or any paths through to the exterior of the house.

How does noise transmit through glass?

There are three key things that happen when sound waves hit a window surface:



- They may be reflected away, minimising any disturbance to the rooms' occupiers
- They may be absorbed through dampening, particularly if a laminated glass is used, and dissipated, again minimising any disturbance to the rooms occupiers
- What isn't reflected or absorbed is transmitted through the window by vibration or air leakage

Sound management

Sound Reduction Index® - What does R and Rw mean?

The Sound Reduction Index® represents the difference between internal and external noise levels and allows for the different sound reduction properties of glass and other materials to be calculated and measured against the requirements of EN ISO 140 (referenced by AS/NZS 1276.1:1999) at different frequency ranges.

Essentially a laboratory measurement, Rw is a weighted sound reduction which incorporates a correction for the ears response to the level of sound. It is used to measure the effectiveness of different types of glass in reducing the level of noise.

Increasing the Rw by 1 is an indication of a 1dB reduction in noise level. The higher the Rw, the better sound insulation the glass has. For example, a piece of 6mm float glass has an Rw of 32 whilst a piece of 6.5mm Silencia™ has a Rw of 36, equal to that of a piece of 10mm float glass.

When calculating the performance of traffic or aircraft noise, an adjustment factor is incorporated dependent on the frequency of the noise from the source. As such for traffic, usually a low frequency noise, the adjustment is represented by Rw +Ctr. For medium frequency noise (the human voice) and for higher frequency noise (aircraft), the adjustment factor Rw + C is used.

Sources of noise

As can be seen from Fig 1, different sources emit different levels of noise. It is the loudness of the sound which directly relates to the level of perceived 'noise' and in order to begin the process of solving a particular noise problem, three key areas have to be considered:

- A determination of / a measuring of the external noise source
- The noise reduction rating of the glass / glazing system
- The required / resulting perceived noise level in the room.

For the glass and glazing, its role is to reduce the external noise level to a desired satisfactory internal noise level; dependant on the particular room's desired use.

AS/NZS 2107 outlines recommended interior sound levels for a broad range of occupancy types including places of worship through board rooms and office spaces to houses and apartments amongst others.

Recommended interior noise levels

Some recommended interior noise levels have been assessed as follows:

Room	dB
Bedroom	30-40
Classroom	35-40
Living Room	40-45
Board Room	40-45
Open Plan Office	45-50

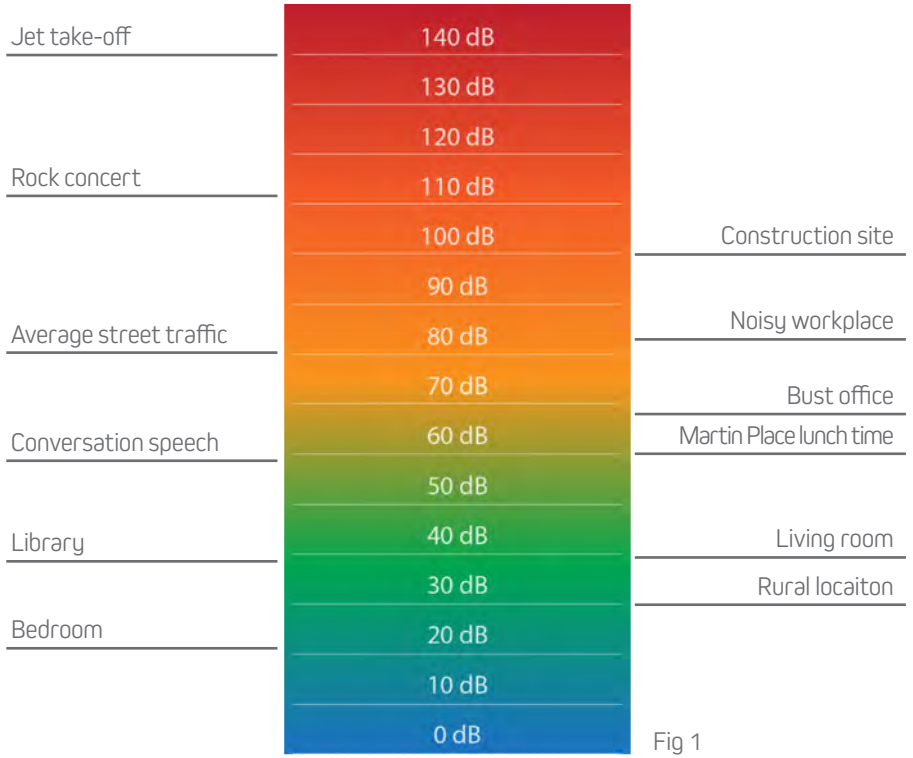


Fig 1

Sound management

Choosing the right solution

In order to choose an appropriate glass to reduce the noise from the relevant external source to a satisfactory internal level, subtract the recommended dB rating of the internal room from the measured external noise source to determine an appropriate Rw value and associated glass type.

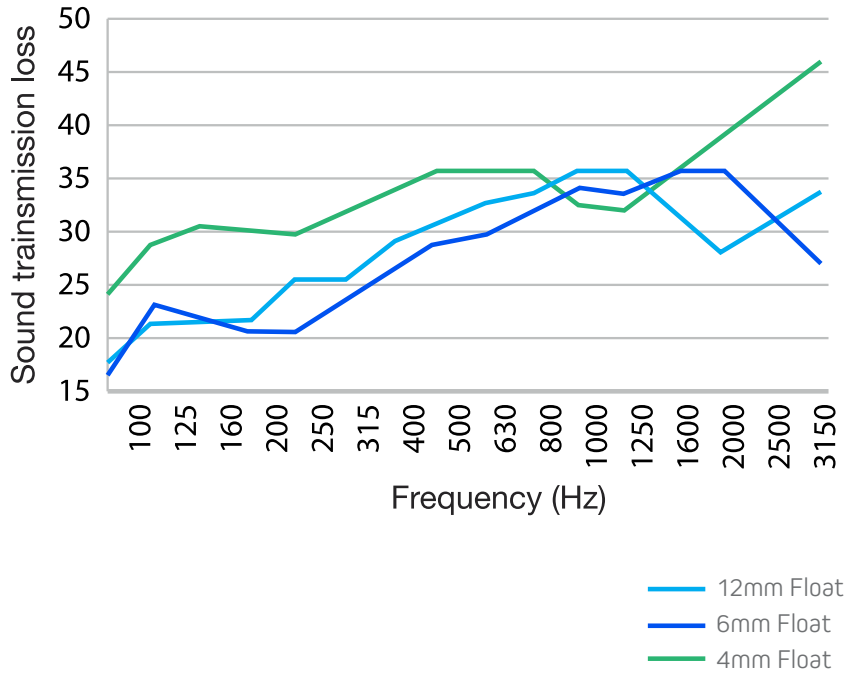
For example, if the noise problem is traffic passing on a minor road outside a main bedroom:

Outside street traffic noise – 80dB

Recommended interior noise level for bedroom – 40dB

Required rating for the window/glass system – 40dB or Rw40.

Potential solution – 12.5mm Silencia™



Some things to consider

For low frequency noises, such as traffic noise, increasing the thickness of the glass will improve its sound insulation. However, whilst it usually happens at the higher frequency range, standard monolithic glass of any thickness has a coincidence dip.

What is a Co-incidence Dip?

The coincidence dip is a frequency range over which the sound insulation properties of the glass will be reduced due to the glass vibrating at the same frequency as the source of the noise, allowing sound to travel through the window more easily.

The coincidence frequency for glass is calculated from the equation.

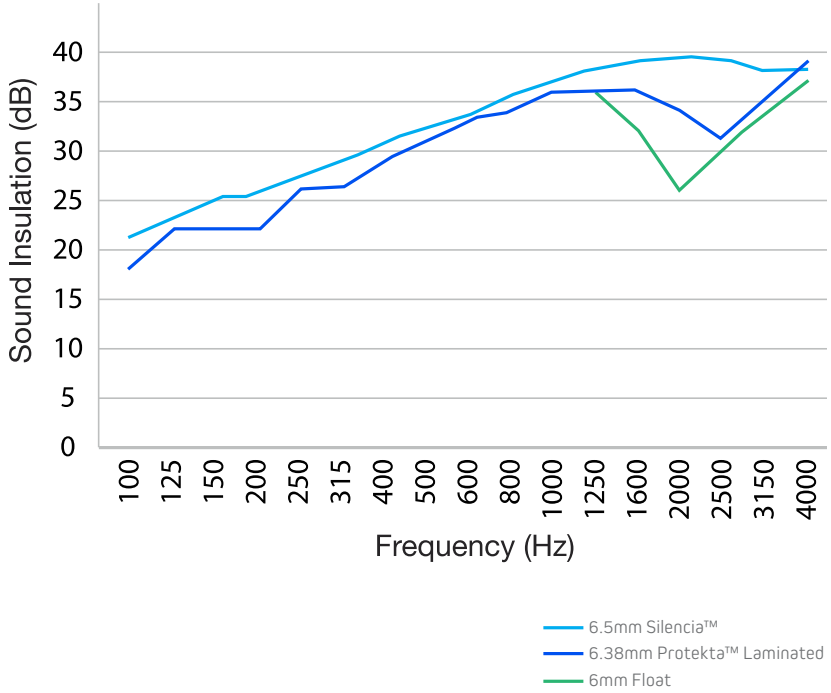
$$f = \frac{12500}{e}$$ Where f = frequency
e = glass thickness

Sound management

Reducing the Co-incidence Dip?

The interlayer in Protekta™ laminated glass allows for superior sound insulation over the same thickness of float glass because of the 'dampening' or sound absorbing effect of the interlayer which reduces the co-incidence dip. Protekta™ is quite effective for noise reduction for internal applications due to its ability to reduce the co-incidence dip attributed to monolithic glass; in-particular for the frequency range 1000-2000Hz, the range attributed to the human voice. This makes Protekta™
a particularly useful glass to be used in office partitions or internal windows.

Silencia™ reduces the co-incidence dip even further meaning thinner, lighter glass can be used to achieve the same, or greater, noise reduction. Note that there is hardly any co-incidence dip when compared to float and laminated glass.



Contrary to popular opinion, standard double glazing (IGU's) do not provide good noise reduction. Using two pieces of standard monolithic glass of the same thickness, effective noise reduction can only be achieved with very wide air gaps of approximately 100mm. However the performance of standard IGU's with air gaps of up to 20mm can be improved by incorporating glasses of different thicknesses in to the IGU or incorporating laminated glass into the IGU makeup. Incorporating Silencia™ into an IGU makeup can significantly improve the noise reduction performance; **Click here** for further information.

Each glass within the Silencia™ range incorporates a special interlayer which has been specifically designed to reduce the co-incidence dip and improve the noise reduction properties even further, maximising the performance possible for each relevant thickness.

Comparative Sound Insulation Data (dB)

	Monolithic							Laminated			Silencia™			
Thickness	3	5	6	10	12	15	19	6.38	10.38	12.38	6.5	8.5	10.5	12.5
Rw rating (dB)	30	32	32	36	37	37	40	33	36	37	36	38	39	40

As with any window glazing system, a window incorporating Silencia™ is only as good as its weakest point. As such, any gaps around the window itself which are not sealed properly or windows which are not fitted correctly will allow noise to pass through. Similarly it is important to ensure that any possible potential entry point for noise, from either under the house or through the roof space is effectively sealed to ensure maximum effectiveness of the glazing.

An MHG Company

Silencia™

Noise Reducing Acoustic Solutions

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Silencia™ Noise Reducing Acoustic Solutions

Effective protection from unwanted noise

As urban areas develop, the volume of traffic increases, the density of buildings increase and the pressure on available land becomes more acute. The subsequent effect of increased levels of noise on the lives and comfort levels of people is becoming increasingly apparent and for some, increasingly untenable.

Silencia™ is one of the most effective glass types in reducing unwanted noise being transmitted through the glazing. Silencia™ can be both single glazed or incorporated as part of any one of the SOLOS Glass IGU range dependent on the level of noise reduction required.

Using a special three layer acoustic interlayer, Silencia™ significantly reduces sound transmission by 'dampening' a broad range of noise levels across a wide frequency range to ensure enhanced sound insulation.

Focusing on frequencies within the 1000-3500Hz range, Silencia™ is therefore effective in reducing the level of noise transmission from a number of different sources including; traffic, aircraft, trains and voices.

The special noise absorbing qualities of the Silencia™ interlayer enables thinner and lighter glass to be used to achieve the noise reduction performance associated with thicker and heavier glass types.

Available in a standard range of thicknesses from 6.5mm through to 12.5mm, Silencia™ can also be incorporated into KlymetControl® IGU to achieve noise reduction levels of up to 45dB.

Silencia™ Noise Reducing Acoustic Solutions

Effective protection from unwanted noise

Sound insulation levels may not be satisfactory to all occupants and are contingent on a number of considerations being in place; gaps being sealed, space being under the house and individual comfort levels. It is always recommended to seek the advice of an acoustic engineer or acoustic consultant to create a solution specific to the type of room, its conditions and the preferred level of noise transmission.

Each glass within the Silencia™ range incorporates a special interlayer which has been specifically designed to reduce the co-incidence dip and significantly improve the noise reduction properties, maximising the available performance possible for each relevant thickness.

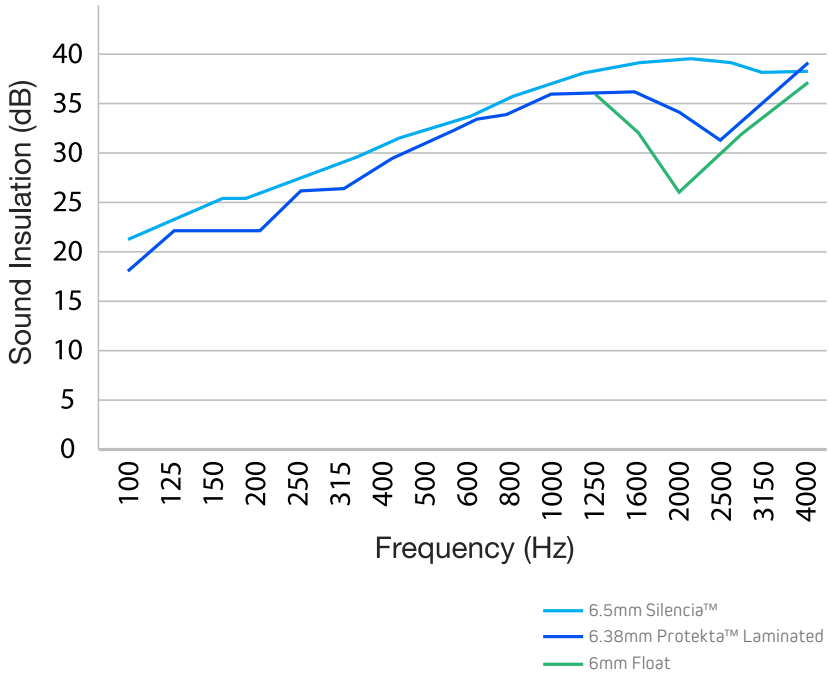
Silencia™ is suitable for a broad range of glazing applications where noise reduction is the prime concern:

- Buildings close to major or minor roads to minimise low frequency traffic noise
- Buildings close to railway lines to minimise high frequency train and rail noise
- Buildings close to airports to minimise high frequency aircraft noise
- Internal walls and windows to provide an oasis away from high frequency voice noise
- Silencia™ can provide over 4dB improvement in noise reduction when compared to glass types of similar thickness. That's significant when a 10dB noise reduction equates to a 50% reduction in loudness

Comparative Sound Insulation Data (dB)

	Monolithic							Laminated			Silencia™			
Thickness	3	5	6	10	12	15	19	6.38	10.38	12.38	6.5	8.5	10.5	12.5
Rw rating (dB)	30	32	32	36	37	37	40	33	36	37	36	38	39	40

As with any window glazing system, a window incorporating Silencia™ is only as good as its weakest point. As such, any gaps around the window itself which are not sealed properly or windows which are not fitted correctly will allow noise to pass through. Similarly it is important to ensure that any possible potential entry point for noise, from either under the house or through the roof space is effectively sealed to ensure maximum effectiveness of the glazing.



Silencia™ Noise Reducing Acoustic Solutions

Benefits

- Available in 6.5mm through 12.5mm thicknesses dependent on the level of noise reduction required
- Can be incorporated into a KlymetControl® or KlymetControl® Plus IGU for further enhanced noise reduction and additional benefits such as energy efficiency, décor or security
- Grade A safety glass with >99% UV protection to prevent fading
- Reduces noise from a broad range of sources across a wide frequency band

Applications

- Buildings close to main roads, airports and railway lines
- Commercial offices and stadiums
- External and internal windows, doors and partitions
- Hospitals and aged care facilities
- Multi density residential apartments and hotels

For further information visit the section on **Sound Management**

An MHG Company

designer

Glass with unforgettable personality

solos glass

see the possibilities

Designer

Whether the preferences are for striking colours, subtle variations in shade, light or texture, or simply providing the ability to make a building particularly unique, the SOLOS Glass designer range of glass products can play a key role in creating an ambience, appearance or functionality unmatched by any other material.

The designer range provides a number of options to fulfil these requirements for both internal and, where appropriate, external applications, enabling creative style to be expressed in a dynamic, functional and cost effective way.

The range includes the following products:

Chroma™ - an extensive designer range of transparent, translucent or opaque coloured laminated glass panels specifically created to make a dramatic, bold statement or a quiet, subtle distraction...and almost anything in between.

ColorSmart™ - a range of bold, vibrant painted glass panels ideal for splashbacks or spandrel applications.

EnVision™ - a digitally ceramic printed decorative safety glass which redefines the process of creative expression for both internal and external applications.

KristalClear™ - a stunning, optimum quality low iron glass providing maximum transparency and true colour transmission across a large range of residential and commercial applications.

Matlucent™ - an etched clear float glass which provides a subtle, satin finish for use in applications where privacy is a key consideration.

Obscura™ - a range of decorative patterned glass providing not only a broad range of thicknesses, styles and surface textures, but also different levels of light diffusion, privacy and obscuration.

ThermoColour™ - a highly durable, weather resistant glass, coated with a UV resistant ceramic paint making it ideal for external facades and cladding.

Valleta™ - an outstanding quality copper free mirrored glass range offering excellent levels of reflectivity and superior levels of corrosion resistance and surface adhesion.

An MHG Company

Chroma™

Decorative Laminated Safety Glass

solos glass

see the possibilities

Chroma™ Decorative Laminated Safety Glass

With a wide range of colours and a choice of transparent, translucent or opaque effects, Chroma™ is the gateway to one of the most comprehensive designer range of laminated coloured glass available.

Being UV resistant, colourfast, water resistant and a grade A laminated safety glass, Chroma™ is the perfect solution for both internal and external applications requiring either a dash of colour, a subtle hue or a dramatic, bold statement.

Chroma™ is a custom manufactured laminated product using Vanceva® interlayers, that can be combined with any glass product combinations from within the SOLOS Glass range, perfectly blending aesthetics with required performance levels.

Vanceva® brings a whole new aesthetic to both interior and exterior applications, including balconies, curtain walls, atriums, skylights, partitions, conference rooms, and glass doors.

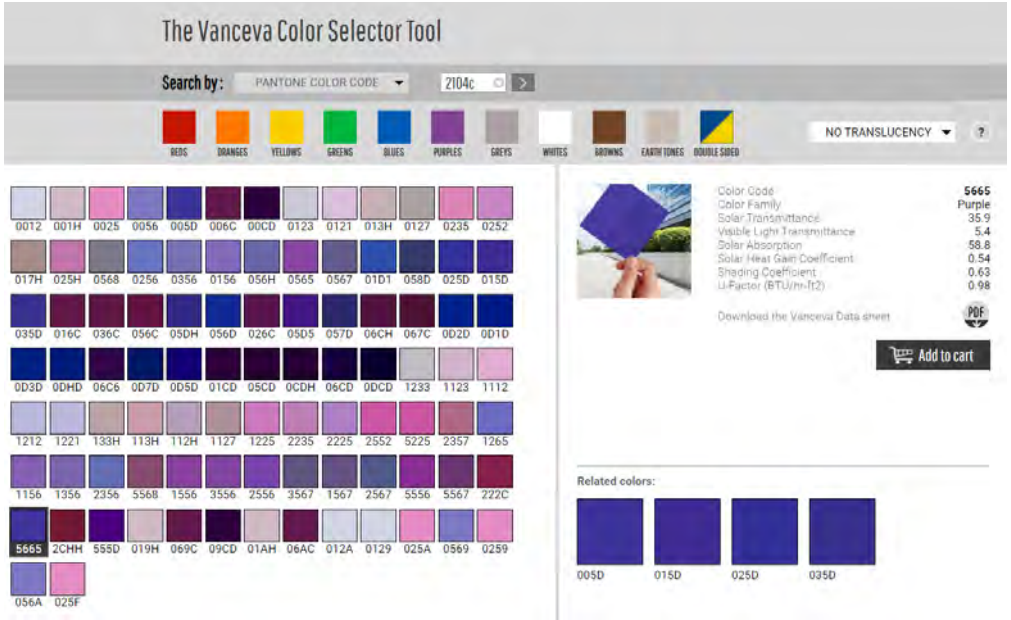
For applications using a white or light coloured interlayer, standard clear glass can induce a light green hue to the finished product due to the levels of iron used in the glass manufacturing process. For such products we recommend the use of KristalClear™ glass to ensure true representation of the finished colour.

A new palette of possibilities

The Vanceva® colour studio offers a broad spectrum of transparent, translucent, and solid glass colour options, giving architects and designers more creative freedom with glass than ever before.

The system is based on a foundational palette of 16 basic colors that can be combined in up to four layers to produce custom-coloured glass. Each Vanceva® colour has been assigned a four-digit number, derived from the combination and order of the foundational colour layers. When Vanceva® coloured interlayers are combined with tinted or reflective glass, the design possibilities are nearly limitless.

The Vanceva® Colour Selector Tool can match standard colour references such as RGB, Pantone, RAL and NCS to the closest match available.



Chroma™ Decorative Laminated Safety Glass

Chroma™ Glass Properties

- Maximum panel size of 6000mm x 2440mm.
- Thickness range can be manufactured to customers' specific requirements in line with their specifications and/or regulatory requirements.
- Can be manufactured using any SOLOS Glass glass product combination including EnviroClear™, EnviroTone™, KristalClear™ and KlymetShield™.
- Standard edge finish is an arrissed edge, although CNC or Polished edge is available contingent on final application or requirement.
- Chroma™ is suitable for any interior or exterior glass application with a wide range of transparency levels.
- A broad range of finish options including transparent, translucent and opaque.
- A range of Grade A safety options are available; Heat soaked, Toughened, Heat Strengthened or Annealed laminated.

How to specify

Select Glass Name:

Chroma™

Select Thickness:

Nominate the relevant properties required or application to be glazed to determine relevant thickness and make-up

Select Colour:

Make the appropriate selection from the Vanceva® Colour Selector Tool

Alternatively contact us to discuss your specific project requirements

Benefits

- Very high image resolution and clarity
- Extensive colour range and intensity
- Internal and external applications
- UV stable

Applications

- Balustrades
- Canopies
- Curtain walls
- Decorative panels
- Facades
- Lifts
- Light wells
- Lobbies
- Partitions
- Sporting arenas
- Staircases

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ColorSmart™

Decorative Painted Glass Panels

solos glass

see the possibilities

ColorSmart™ Decorative Painted Glass Panels

What is ColorSmart™

ColorSmart™ is a range of vibrant painted glass panels manufactured by SOLOS Glass for use in a broad range of internal applications or encapsulated external applications such as spandrel panels.

ColorSmart™ Features

ColorSmart™ is available in a range of thicknesses between 4mm and 19mm and in a maximum size of 4400mm x 2400mm.

Utilising the complete range of Dulux colours as its base palette, ColorSmart™ utilises a superior colour coating system which involves a combination of special hardening and glass keying agents to create one of the most contemporary, practical and stylish range of coloured glass products available.

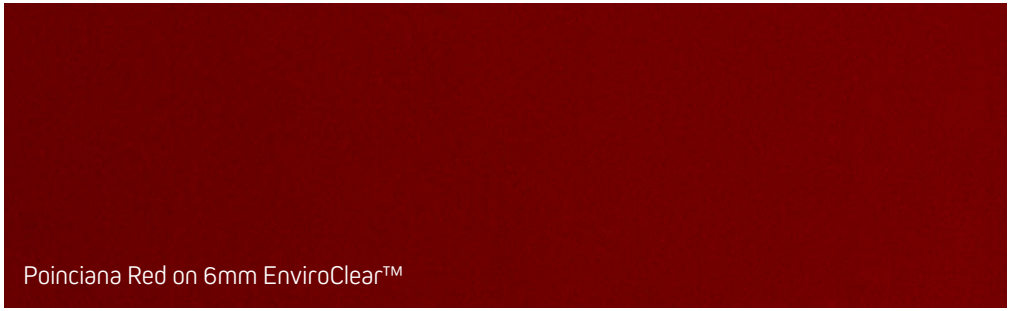
ColorSmart™ is available in both annealed and toughened form and can be glazed either monolithically, as a component of a specialist custom laminated product or double glazed as part of a KlymetControl® IGU.

ColorSmart™ is the ideal choice for producing that bold, vibrant colour, for stylishly matching that neutral tone or for creating that wholly individual stunning metallic finish.

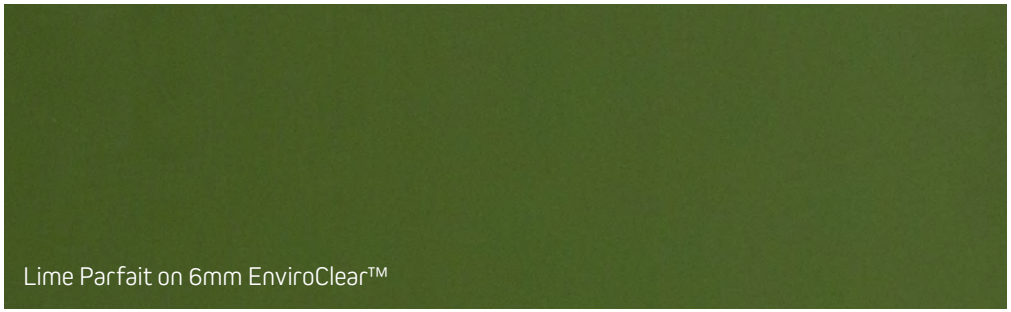
ColorSmart™ Colour Range

Any colour from the complete Dulux colour range can be matched to form the range of ColorSmart™ colours available.

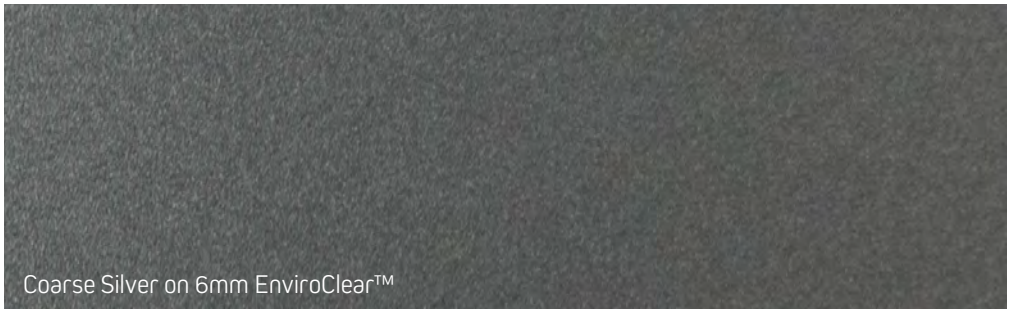
See website: **www.dulux.com.au/colour/all-colours**



Poinciana Red on 6mm EnviroClear™



Lime Parfait on 6mm EnviroClear™



Coarse Silver on 6mm EnviroClear™

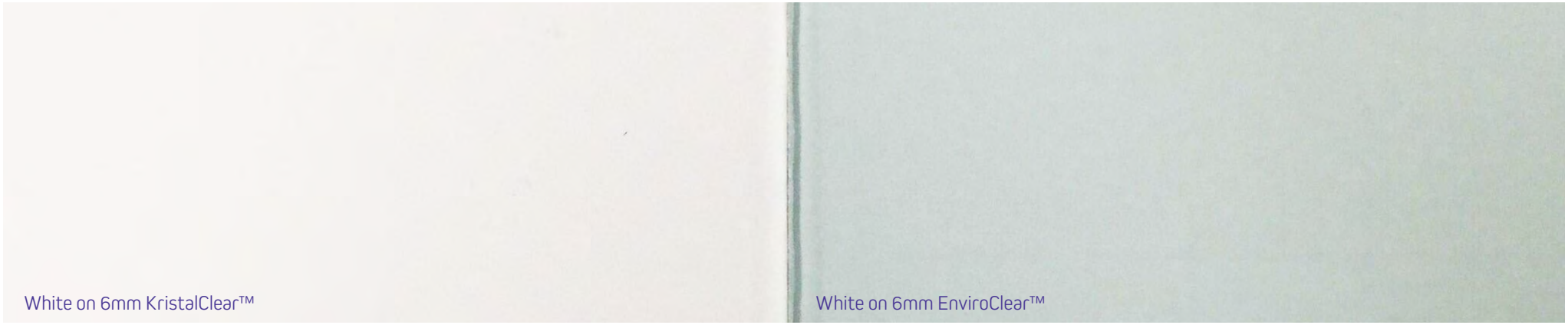
ColorSmart™ Decorative Painted Glass Panels

ColorSmart™ Applications

Splashbacks

ColorSmart™ is perfect for using in kitchen or laundry splashback applications. Readily processed to be able to accommodate cut outs, powerpoints or rangehoods, ColorSmart™ is available with either EnviroClear™ or KristalClear™ base glass.

Because standard clear float glass can make some light and neutral colours appear to have a slight green hue, when choosing light and neutral colours for splashbacks we recommend that ColorSmart™ is manufactured using KristalClear™ low iron glass. We pride ourselves on ensuring that the colour you want is the colour you see.



White on 6mm KristalClear™

White on 6mm EnviroClear™

ColorSmart™ Decorative Painted Glass Panels

ColorSmart™ Applications

Spandrels

ColorSmart™ is an ideal product for encapsulated spandrel panels, either to seamlessly blend with the vision areas or to provide a sharp contrast.

When using ColorSmart™ to act as a spandrel panel in order to blend with the surrounding vision areas, it is important that the painted side of the panel always faces the building.

When glazed as part of a KlymetControl® IGU, ColorSmart™ should always be incorporated as the back panel of a KlymetControl® IGU to enable the back panel to provide the required opacity, the front panel to provide the aesthetic match and the IGU to provide the overall required performance.

Benefits

- Wide range of colours as its standard palette to provide absolute design freedom
- Short lead times for both standard and custom colours
- Can be supplied as laminated, toughened, heat strengthened or as one panel of an IGU
- Highly durable, non porous and easily maintained
- Suitable for internal and encapsulated external applications
- Grade A safety glass to AS/NZS 2208 when supplied as laminated or toughened
- Can easily complement or contrast with the vision area of a building when used as a spandrel panel

Applications

Smooth, easy to clean and durable, ColorSmart™ is the perfect solution for an increasing number of applications including:

- Automotive and marine
- Internal and external wall cladding
- Kitchens and bathrooms
- Roof lights and canopies
- Spandrel panels and building facades
- Splashbacks

An MHG Company

EnVision™

Digitally Printed Safety Glass

solos glass

see the possibilities

EnVision™ Digitally Printed Safety Glass

Imprint Your Vision

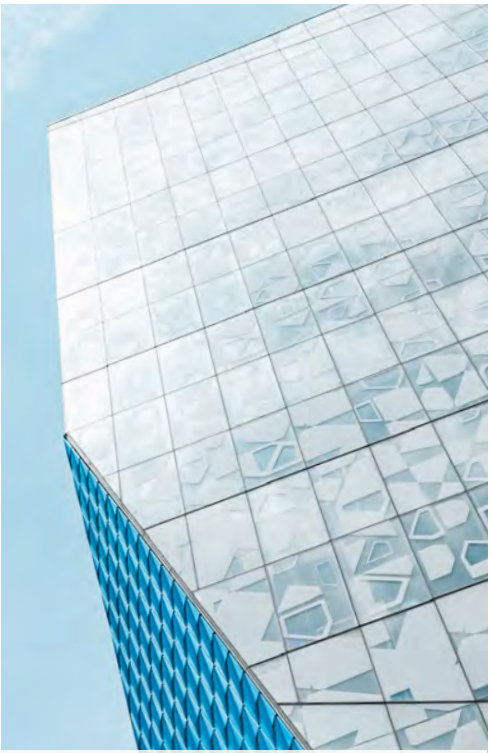
Manufactured using the highest quality ceramic inks and photorealistic 1410dpi image resolution, EnVision™ is a digitally printed safety glass which helps transform and translate any design concept or image into architectural reality.

Available as single toughened glass, a custom laminate or as part of an IGU, EnVision™ is suitable for a broad range of internal or external applications in both residential and commercial buildings; from splashbacks and shower screens through to building facades and curtain walls.

Through EnVision™, glass can now be seen as the new architectural canvas; the platform on which the ultimate visual impact can be created and inspiration communicated. There are endless design possibilities with no need to compromise creativity in order to meet legislative requirements.

Le Meridien Hotel – China

Kuopio University Hospital – Finland



Ryerson University – Canada

The Product

One of the key characteristics of EnVision™ is the role it plays in not only providing unlimited design potential, but also the flexibility it provides to the design process.

Printed on any standard glass thickness between 4mm and 19mm and capable of being manufactured in large individual panel sizes of up to 6m x 3.3m, any image or design can also be easily scaled up across multiple panels to create a visually stunning graphic across a complete building facade or bespoke interior walls.

EnVision™ Digitally Printed Safety Glass

Concept to manufacture

1 – Design Concept & Illustration

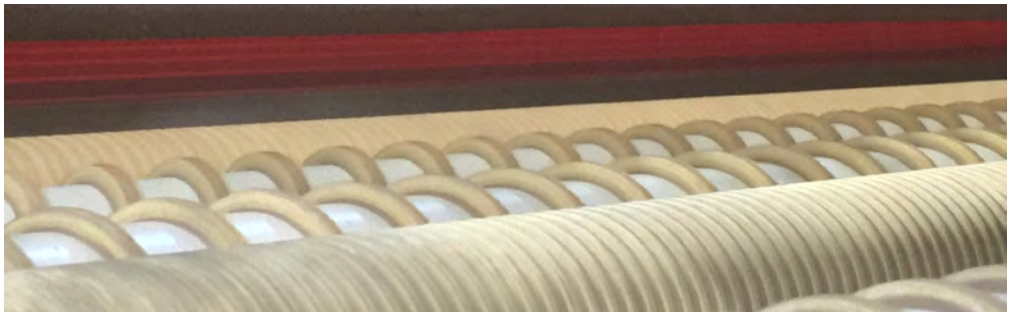
Graphic files (PDF, PS, EPS, Tiff, BMP, JPEG, etc.) created through the design process are provided to us and fed into the DXP 3 glass design and graphics platform.

2 – Graphics Conversion

The heartbeat of the EnVision™ manufacturing process, with a range of specialist features the DXP 3 software automatically turns the respective graphic file into a ready to print image.

3 – Glass Preparation & Digital Printing

The glass is selected from stock and transferred onto the cutting table where it is cut prior to being automatically washed and positioned on the Dip-Tech™ NEra D digital printer. Here the design is printed on the glass surface and automatically dried prior to being transferred into the toughening furnace via the fully integrated conveying system.



4 – Further Processing

Toughening the printed glass permanently fuses the image/design into the glass surface. If required, the printed glass is then either incorporated into an IGU or custom laminated to suit the application prior to being packed and subsequently distributed.

EnVision™ Digitally Printed Safety Glass

Ceramic inks

EnVision™ is manufactured using only the highest quality ceramic inks, with each type of ink used performing a range of different functions across any design from standard dots and lines, through multicolour patterns to photorealistic images.

All EnVision™ inks are supplied by Dip-Tech™/Ferro™ and do not contain lead or cadmium:

- The Spectrum series of 6 high performance core colours are used to create the extensive range of shades and colours
- The Light Diffusion series enables effective privacy and light control to be achieved through different etch effects
- The Precious Metal series provides extra shine and reflectivity for the perfect metallic effect
- The S1 series is applied to the external surface of the glass, offering extreme resistance to weather and chemicals, as well as providing additional glare and reflection control.

Single colour dots & lines | Multicolour patterns | Photo-realistic images

Applied to the glass surface through precise micro-dot printing using the latest digital printing technology, ceramic ink becomes fused to the glass itself during our carefully controlled toughening process. This forms a permanent, durable surface which is highly resistant to UV, scratching and even acid attack and also ensures that each piece of EnVision™ meets the Grade A safety glass requirements of AS 2208.

With the key resistance criteria of the ceramic inks also measured, tested and certified against some of the World's leading industry standards, the performance of EnVision™ is further supported and recognised.

Test Type	Industry Standard
Weathering Resistance	ISO-11341 (ISO-16474)
Acid Resistance	ASTM C 724-91, ASTM 777-04
Alcohol Resistance	UNE-EN 15200
Scratch Resistance	AS 3894.4, EN 438-2, ISO 4586-2
Stain Resistance	UNE-EN 15200

EnVision™ Digitally Printed Safety Glass

Create Innovative Design Solutions

EnVision™ is the perfect glazed solution for offering high resolution imagery and clarity, which also offers stunning functional effects and levels of performance across a number of applications. The only limit is your imagination.

Facades & Curtain Walls

Through EnVision™, spectacular and unique building facades can be created. Unique, energy efficient and visually stunning, a custom designed facade or curtain wall using EnVision™ blends vibrant colours with an improved ability to create durable, iconic designs whilst being able to further control the levels of VLT, SHGC and U Value.

Partitions & Room Dividers

Whether you choose from the range of EnVision™ Vector Patterns or Natural Elements, enhancing a standard clear or translucent laminated glass creates a stunning addition to either the working environment or an individual statement within a home. EnVision™ can be central to maintaining a spacious feel, offering levels of privacy whilst opening up the room or working space to extra light.

AFI Mall – Russia

New Town Hall – Spain

Irving Public Library – Texas

Ubersee Museum – Germany

Green City – Minsk

Origami Building – France

Médéric Building – France

EnVision™ Digitally Printed Safety Glass

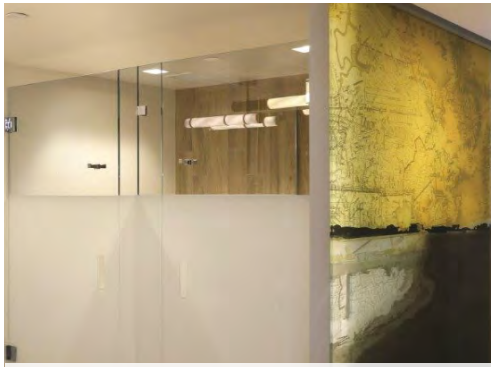
Shower Screens

Providing a subtle level of privacy or a bold statement in style is something that the environment of a bathroom often requires to transform its look or add a level of comfort to what is essentially, a personal space. Using an individual design or one of the standard designs offered through either the EnVision™ Vector Patterns or Natural Elements range provides an easy to clean and individual visual statement.

Walkways

Airports, hospitals, hotels, educational facilities, railway stations and bus interchanges are but a few examples of where printed glazed walkways offer significant design and/or communication opportunities.

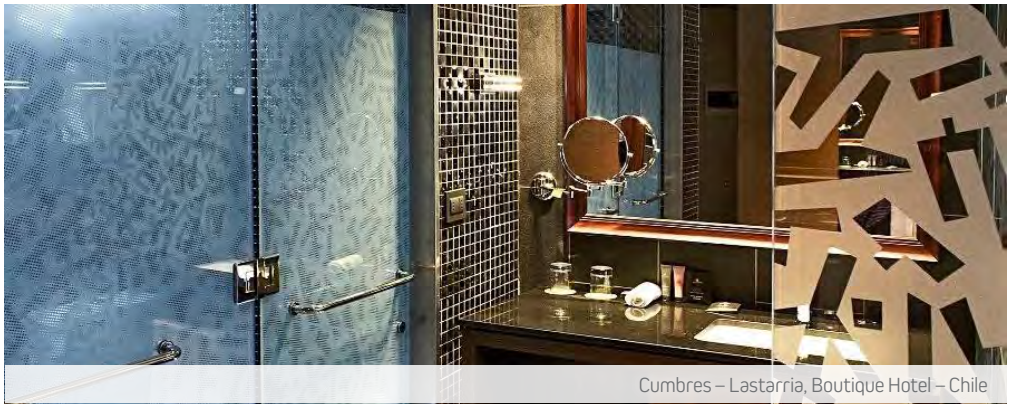
'Telephone Booth' Shower – USA



Envoy Hotel – Massachusetts

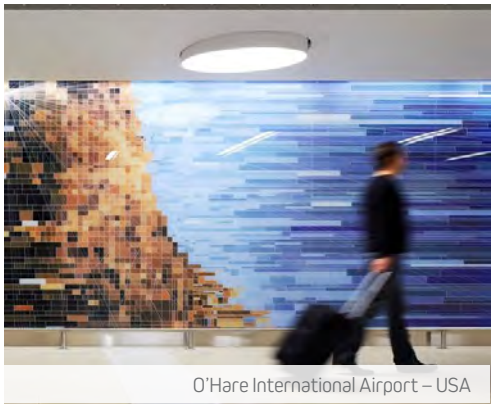
Water Park – Germany

Carrefour Laval – Quebec



Cumbres – Lastarria, Boutique Hotel – Chile

Kansas University – USA



O'Hare International Airport – USA

EnVision™ Digitally Printed Safety Glass

Roofing

EnVision™ brings a whole new dimension to the term 'letting in more light' through a roof or ceiling. Providing incredible design opportunities without compromising on the required integrity and loading requirements demanded by such elements, EnVision™ will enthral as well as captivate, fascinate as well as delight. It opens up and brings new life to a part of a building often seen more from a perspective of pure functionality rather than its design and light providing potential.

Memorials and Signage

Commemorating a special event, remembering loved ones, celebrating culture or publicly showcasing artistic vision can all be beautifully presented with EnVision™. Vibrant colours, different effects and outstanding durability all combine to both preserve the past and shape the future.

Children's World Toy Store – Russia

Hanjie Wanda Plaza – China

WWII Memorial – USA

Sarasota Memorial – USA

Jewellery Trade Centre – China

Battle of Cemetery Hill Mural – USA

Siesta Key Beach Pavilion – USA

EnVision™ Digitally Printed Safety Glass

Splashbacks

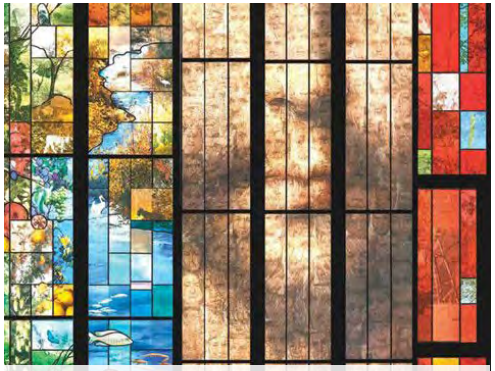
An EnVision™ splashback provides that personal touch and a perfect combination of stunning design, ease of cleaning and long-lasting durability.

Whether it's a design from the EnVision™ Natural Elements range where the look of stone or wood brings the outside world in to your kitchen or an individual design, photorealistic art installation or mood-setting scene, EnVision™ is a practical, functional and safe solution.

Stained Glass Windows

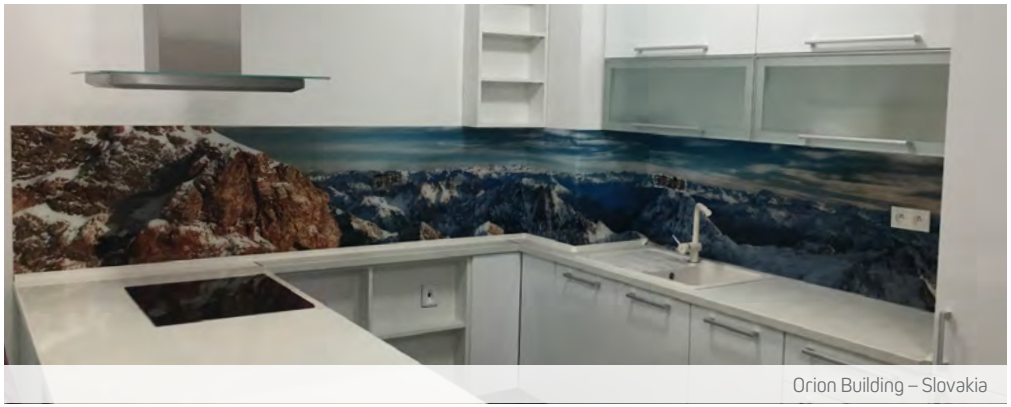
Creating or replacing stained glass windows or doors is a specialist craft and potentially an expensive exercise. Ideally suited to refurb projects, EnVision™ can match existing window designs or perfectly reproduce any bespoke design. EnVision™ offers a pragmatic, durable and superbly detailed alternative way of presenting stained glass images, which in no way compromises the atmosphere or enduring images of celebration that traditional stained glass windows represent.

Private Home – Finland



Strasbourg Cathedral – France

Stained Glass Chapel – USA



Orion Building – Slovakia

The Jane Restaurant – Belgium

EnVision™ Digitally Printed Safety Glass

Balustrades

Balustrades also offer excellent opportunities to showcase printed glass which can in turn provide design, style and aesthetic innovation.

With no compromise on safety to achieve the desired look, balustrades are the perfect canvas to express that personal touch or that link with the immediate environment, both internally and externally. Ensuring privacy without blocking light, blending in with nature, opening up the external view, enhancing the inner sanctuary or just maintaining that spacious feel with a new look are all core benefits of EnVision™.

Apartment Building – France

SDU Technical Faculty – Denmark

'Green House' – Norway

EnVision™ Digitally Printed Safety Glass

Colour matching

When specifying colours, colour libraries such as Pantone, Dulux and RAL should be referred to as a guide only. EnVision™ uses the Dip-Tech™ Spectrum R Ceramic Ink Series for all applications.

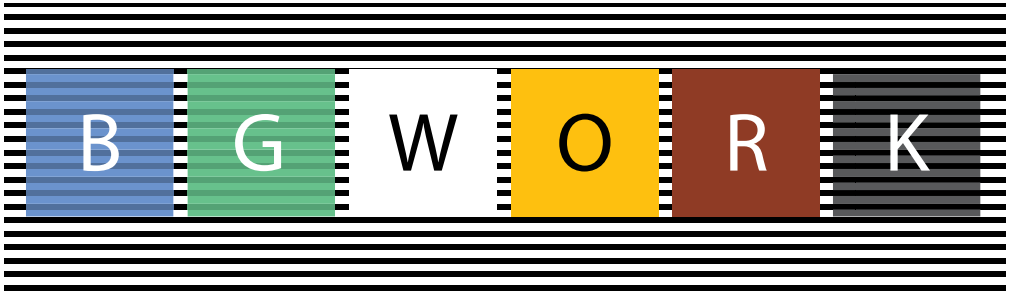
The Spectrum R Ceramic Ink Series uses a unique 6-spot colour mode (blue, green, white, orange, red and black - BGWORK) to achieve a full range of colours. Please note, the BGWORK colour mode differs from the traditional 4-spot CMYK colour mode.

The Spectrum R Ceramic Ink Series are lead and cadmium free, therefore we are unable to produce magenta, bright pinks and rich purples.

Important note: Due to variances in pigments, paper, digital screens and glass appearance e.g.tones & thickness there may be some differences between the selected colours and the final appearance on glass. It is highly recommended to request a sample for colour verification against your artwork.

Ink transparency

The Spectrum R Ceramic Ink's all display differing levels of transparency. The Blue and Green inks have additional transparency, which can be mixed with other inks to achieve less transparent Blues and Greens. Please consult our in-house design team for further advice and clarification on ink transparency.



Viewing conditions

There are some variables that may affect the actual appearance printed on the glass, such as light, angles, viewing side and distances, glass type and thickness.

The viewing distance influences the appearance of the artwork. It is highly recommended that if an artwork is to be viewed in close proximities that it is printed at the highest possible resolution.

Text

Text requirements should be created through Adobe Illustrator or a similar vector based program to maintain the integrity of the text without compromising your design.

Font size for text on clear glass must be no smaller than 12pt. Text on coloured glass should be no smaller than 14pt and a heavier font weight to minimise the risk of ink bleeds.

EnVision™ Digitally Printed Safety Glass

Sample requests

SOLOS Glass will provide one 450mm x 450mm sample per project for client approval. Additional sample requirements may incur a fee.

Please contact us to discuss your specific project and sample requirements.

Sign off process

1. 450mm x 450mm sample provided for sign off on colours, resolution and transparency
2. Digital proof emailed for sign off on scale and position of artwork on glass

No production will commence until both sign offs are received.

In-house Designers

With an in-house team of Graphic Design professionals, SOLOS Glass can bring your vision to reality. To contract our design team for artwork creation, additional fees will apply. Call us to discuss your specific project requirements.

How to specify

Glass Capabilities

- Min glass size: 450mm x 450mm
- Max glass size: 6000mm x 3300mm
- Glass thickness: 4mm - 19mm

Graphics (Vector)

- File Type Required: EPS, AI or PDF
- 300dpi min resolution
- RGB colour space
- All layers unlocked
- Text converted to outlines
- All spot colours converted to CMYK or removed from artwork

Photographic Files

- File Type Required: TIFF, JPEG, or PSD Format
- 300dpi min resolution
- RGB colour space
- All layers unlocked

Note: Photographic images need to be supplied at the highest possible resolution.

EnVision™ Digitally Printed Safety Glass

Benefits

- Combines market leading design options with the highest levels of performance and functionality
- Maximum individual panel sizes of 6m x 3.3m with fully scalable high resolution images and designs
- Manufactured as toughened, custom laminated or as a component within an IGU
- Applied to any glass thickness from 4mm through 19mm
- Photorealistic reproduction of any design or image with 1410dpi resolution
- Control the levels of transparency, translucency and opacity easily
- Eco-friendly, sustainable and recyclable printed glass solution
- Highly durable and resistant to scratching, acid, UV and weather
- Double sided design options available
- Extensive colour range and finish options
- Heavy metal free inks

Applications

- Automotive/Transport
- Canopies
- Curtain walls
- Decorative panels
- Internal and external wall cladding
- Memorials and signage
- Partitions and room dividers
- Roofing
- Shopfronts and retail glazing
- Shower screens and splashbacks
- Spandrel panels and building facades
- Stained glass windows
- Staircases
- Walkways

An MHG Company

KristalClear™

Low Iron Glass

solos glass
see the possibilities

KristalClear™ Low Iron Glass

KristalClear™ is a low iron float glass which consistently provides market leading levels of transparency, light transmission, clarity and visual brilliance not found in standard clear float glass of comparable thickness.

Crisp, clear, brilliant

The superior light transmission, clarity and distinctive edge is achieved through the use of sand with much lower iron oxide content being used in the batch mix when the glass is manufactured on a float line.

Available in thicknesses from 4mm through 19mm, KristalClear™ Low Iron float glass is a specialist ultra clear glass offering the highest possible levels of light transmission and visual clarity combined with a stunning, clear, crisp edge differentiating it easily from the dull green edge associated with standard clear float glass.

KristalClear™ Low Iron Glass

Absolute clarity...regardless of thickness

As the thickness increases through the range of KristalClear™, the difference in clarity between it and clear float glass becomes apparent. The light transmission of KristalClear™ remains constant through the thickness range whilst the green hue on the edge of the standard clear float glass is increasingly evident in combination with reduced light transmission as the glass becomes thicker.

Maximise Light Transmission

KristalClear™ maximises light transmission through the glass for applications where optimal visual appearance is required. Whilst KristalClear™ has a high SHGC, the high levels of light transmission can assist in maximising passive solar heat gain, making it an ideal product for the external pane of an IGU, especially in cool or cold climates.

True Colour Representation

When painted, especially with lighter colours such as white, light or neutral tones, KristalClear™ helps facilitate a much more true and accurate representation of the painted colour. White appears white, not a white with a light green hue.

KristalClear™ Low Iron Glass

Applications - Residential

Easily toughened, laminated, painted or processed, with its high levels of light transmittance, true colour transmission and crisp, clear edges, KristalClear™ redefines the effects of light and space.

Highlighting that safety can also come with style, KristalClear™ is perfect for use in:

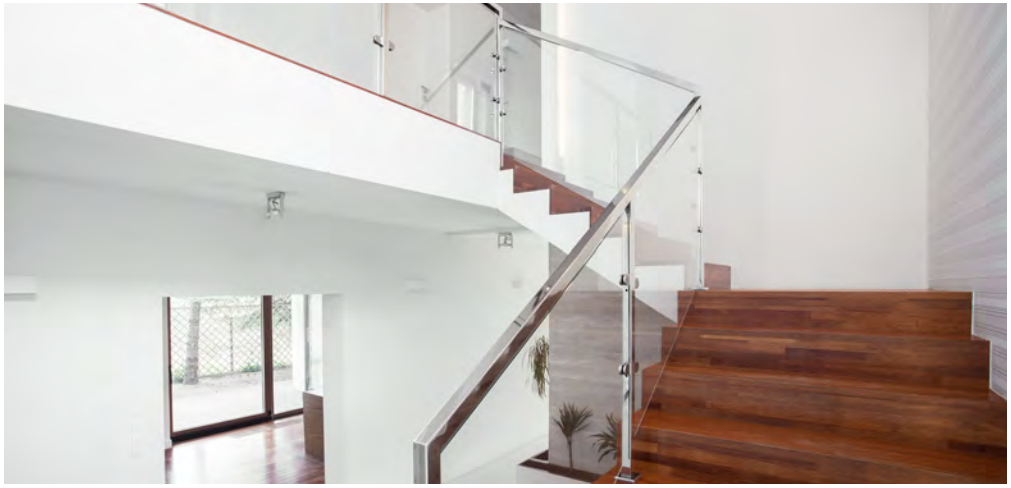
Splashbacks

Frameless shower screens

KristalClear™ Low Iron Glass

Applications - Residential

Staircases



Balustrading and pool fencing

Furniture/Shelving

KristalClear™ Low Iron Glass

Applications - Commercial

Safety & Security

For safety and security applications where extra protection is usually required through the use of multi laminated thicker glass, KristalClear™ provides a level of clarity, trueness of colour and lack of distortion not found in such products utilising standard clear float glass.

Many applications go hand in hand with the need for security, high light transmission and superior visual clarity; zoological enclosures, aquaria, museums and retail jewellery locations are but a few of many examples.

A key property of KristalClear™ is that the level of light transmission is virtually identical regardless of thickness, ie the level of light transmission for 4mm KristalClear™ is 91%, the level of light transmission for 19mm KristalClear™ is 90%.

Shopfront Glazing

With outstanding brilliance and high levels of light transmittance, KristalClear™ used in shopfronts and retail environments lets the true colours and appearance of goods shine through to the consumer. Easily laminated for safety, UV protection and security, KristalClear™ is the ideal shopfront glazing solution.

KristalClear™ Low Iron Glass

Comparitive performance data

Glass Thickness	Light Transmission %	
	EnviroClear™	KristalClear™
4mm	89	91
6mm	87	91
8mm	86	91
10mm	85	91
12mm	84	91
15mm	82	91
19mm	80	90

KristalClear™ single glazed performance data

Nominal thickness	Visible Light (%)		Solar Energy (%)		UV Trans. (%)	SHGC	U Value
	Trans.	Refl.	Trans.	Refl.			
4mm	91	9	90	8	78	0.90	5.90
5mm	91	9	89	8	72	0.90	5.90
6mm	91	9	88	8	74	0.89	5.80
10mm	90	9	86	8	66	0.88	5.70
12mm	90	9	86	8	66	0.88	5.60
15mm	90	9	83	8	57	0.86	5.50
19mm	90	9	82	8	54	0.85	5.40

Benefits

- Very high light transmittance of up to 91%
- Outstanding clarity and brilliance of appearance
- Clear edge with a distinctive light blue hue
- True representation of light and neutral colours when painted
- Easily toughened, laminated or edge worked.
- Maintains the same colour throughout the full thickness range
- Distortion free when laminated due to the high levels of light transmission

Applications

- Aquaria
- Balustrades, staircases
- Entrances, atria and reception areas
- Facades
- Frameless shower screens
- High security glazing applications such as jewellery stores, museums, exhibitions
- Splashbacks
- Shopfronts and retail furniture
- Zoological viewing areas

An MHG Company

Matlucent™

Decorative Etched Glass

solos glass
see the possibilities

Matlucent™ Decorative Etched Glass

Matlucent™ decorative glass is a clear float glass which has been etched on one side to create a subtle, satin finish, ideal for a number of internal applications where the retention of high light transmission and the need for privacy are key considerations.

The Matlucent™ etched, matt satin finish provides a consistent, even light diffusion evoking a high quality, natural hue ideal for internal partitions and windows, shower screens, doors or balustrades.

Available applied to either a standard float substrate or, where absolute clarity and pristine lines are preferred, a KristalClear™ low iron substrate.

Matlucent™ Product Range

Product	4mm	6mm	10mm	12mm
Matlucent™	✓	✓	✓	✓
Matlucent™ KristalClear™	✓	✓		✓

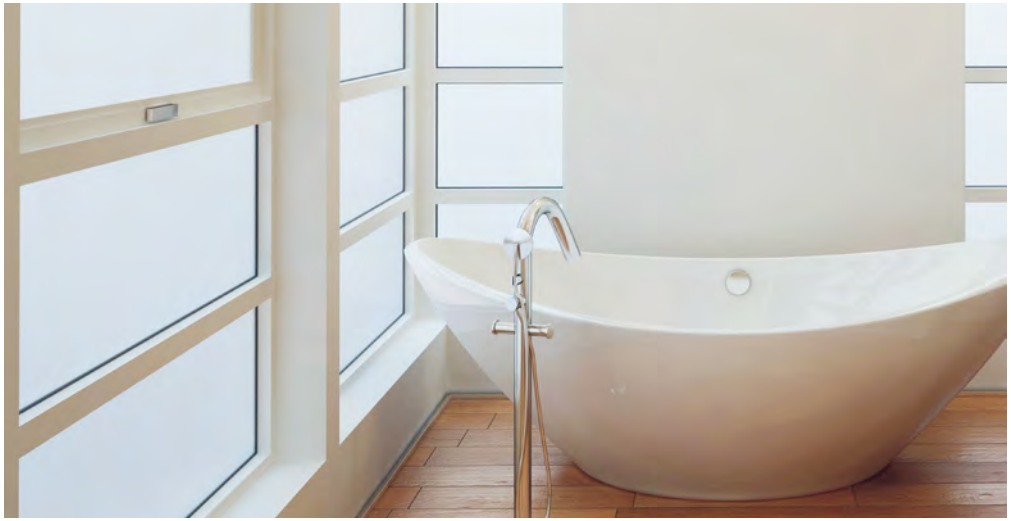
Where impact resistance and safety are also a prime concern, a toughened and a laminated version of Matlucent™ are also available. Both products comply with the requirements of AS/NZS2208 for Grade A safety glazing materials.

Benefits

- Consistent, satin matt finish with low levels of reflectivity
- High levels of light transmission
- Diffuses light offering high levels of privacy
- Easily cleaned
- Available in annealed or as a Grade A safety material to AS/NZS 2208 when laminated or toughened
- Available on a standard float substrate or on a KristalClear™ low iron substrate
- Opens up living spaces whilst providing a calm, sanctuary feel to the respective space

Applications

- Internal partitions and screens
- Internal privacy windows and doors
- Internal balustrading and staircases
- Painted Splashbacks
- Shower and bath enclosures



An MHG Company

Obscura™

Decorative Textured Glass

solos glass

see the possibilities

Obscura™ Decorative Textured Glass

Design and privacy options

Obscura™ is a range of decorative patterned glass from SOLOS Glass providing not only a broad range of thicknesses, styles and surface textures, but also different levels of light diffusion, privacy and obscuration.

Traditional product with modern style

Each Obscura™ pattern is as individual as it is practical. Obscura™ is readily available in a number of different thicknesses from 4mm through 10mm and remains one of the most relevant and cost effective ways of providing design options with either antique or modern décor.

Obscura™ is manufactured in the traditional way of rolling molten glass through twin rollers, which results in a permanent imprint on one side of the glass surface.

Levels of obscurity

Obscura™ offers a range of different levels of obscurity and privacy. Regardless of the level of obscurity, each product in the range retains high levels of light transmission.

Level 1 for most obscuration, appropriate for applications where privacy is most important, for example bathroom windows or room dividers.

Level 2 for least obscuration, where a subtle level of obscuration is desired.

Safety glass options

There are different glass options within the Obscura™ range is available in either a toughened or laminated form for use when a Safety Glass to AS/NZS 2208 Class A is required.

Directional patterns

The Narrow Reeded and Africaan patterns are directional in nature and can create a completely different aesthetic glazed vertically (portrait) or horizontally (landscape).

For a horizontal pattern design

For a vertical pattern design

Obscura™ Decorative Textured Glass

SOLOS Glass Obscura™ Glass Range

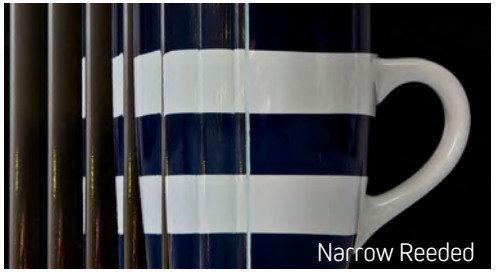
						Safety		Obscurity	
Product Name	4mm	5mm	6mm	8mm	10mm	Toughened	Laminated	1	2
Africaan		✓	✓		✓	✓		✓	
Aqualite	✓	✓				✓	✓		✓
Cathlite	✓	✓				✓	✓		✓
Kasumi	✓	✓		✓		✓		✓	
Mistlite	✓	✓	✓			✓	✓	✓	
Narrow Reeded			✓		✓	✓			✓
Nashiji	✓	✓	✓			✓	✓	✓	
Wirecast			✓					✓	

Benefits

- Contemporary and cost effective
- Can be toughened or laminated
- Broad range of applications
- Different levels of privacy and levels of obscuration
- Different thicknesses for different applications
- Clear and toned option

Applications

- Bathroom enclosures
- Door inserts
- Interior partitions
- Lead lights
- Windows for decoration and privacy



An MHG Company

ThermoColour™

Ceramic Painted Glass Panels

solos glass
see the possibilities

ThermoColour™ Ceramic Painted Glass Panels

What is ThermoColour™?

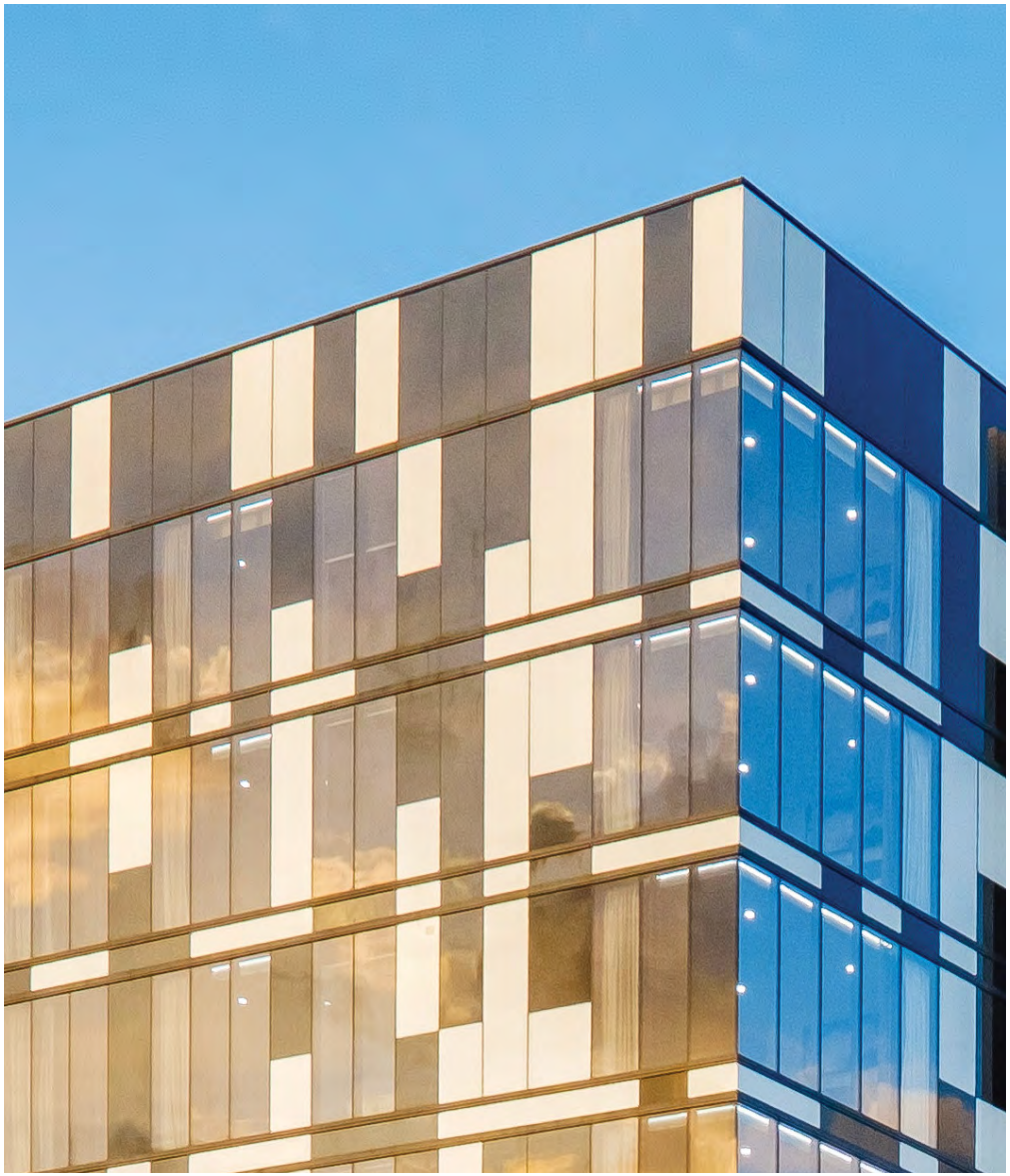
Available in toughened form only, ThermoColour™ is a highly durable, weather resistant decorative glass manufactured by applying a UV resistant ceramic coating to one surface of the glass which is then permanently fused to the glass surface during the toughening process. This process results in a scratch resistant and permanent coloured coating on the glass.

ThermoColour™ Features

ThermoColour™ is available in either black or white as standard colours and is nominally 6mm thick. Available in a maximum size of 3210 x 2550mm, ThermoColour™ can also be supplied as one panel of a KlymetControl® IGU.

True Colour Representation

To ensure the truest colour representation, ThermoColour™ White is manufactured using KristalClear™ low iron float glass as the glass substrate.



ThermoColour™ Ceramic Painted Glass Panels

External Wall Cladding and Spandrel Glass

External applications

ThermoColour™ is ideal for use as an opaque wall cladding material or as a spandrel panel to either contrast or complement the vision glazing. ThermoColour™ is specified and used for both applications because of its opaque appearance, excellent hiding properties, low maintenance and superior resistance to heat when compared to annealed or laminated glass.

Installation tips

Regardless of whether the glass is used as a cladding material or as a spandrel panel, care should be taken to avoid backlighting the product. The painted side of the panel should always be glazed to the interior of the building.

Reduce thermal breakage

When used as a spandrel panel, functionally the glass is used to hide the building structure between floors. The heat treated nature of ThermoColour™ for such applications precludes the threat of thermal breakage due to excessive heat build up in the area immediately behind and surrounding the glass.

Internal splashbacks and decorative panelling

ThermoColour™ is also used for internal decorative glass cladding applications including splashbacks, internal wall panelling, lift shaft panelling and lift walls for both the residential and commercial market.

Key Features

- Available in both black and white as standard
- Maximum panel size of 3210 x 2550mm
- Only environmentally friendly lead free ceramic coatings used
- Available as monolithic 6mm toughened panels or as one panel of a KlymetControl® IGU
- ThermoColour™ White is manufactured using KristalClear™ low iron glass for optimum colour reproduction

Benefits

- Permanent, durable and non-porous coating which becomes permanently fused to the glass surface after toughening
- Suitable for both external and internal applications
- Solid colours with 100% finish and excellent opacity
- Very durable and scratch resistant coating which will not crack from temperatures of up to 250ºC
- Grade A toughened glass meeting the requirements of AS/NZS 2208
- Available heat soaked
- Can be manufactured to any shape outlined in the SOLOS Glass shape catalogue
- Easily maintained

Applications

- External facades and wall cladding
- Spandrel Panels
- Splashbacks

An MHG Company

Valleta™

Decorative Silvered Glass

solos glass
see the possibilities

Valleta™ Decorative Silvered Glass

Opening up the living space

The Valleta™ range provides the opportunity to open up living areas through the use of light and reflection to create the illusion of additional space.

Valleta™ Mirror

Valleta™ Mirror is a range of environmentally friendly, copper free mirrors available in clear, grey or bronze tones. Using a twin layer water resistant paint backing, Valleta™ offers superior resistance to acid and moisture absorption.

Valleta™ Mirror is also available in vinyl backed form when a safety glass is required in order to meet NCC requirements.

Valleta™ VB

Where impact resistance and safety are a prime concern, Valleta™ VB is backed with a smooth, permanently adhered vinyl back film, this increases the ability of the glass to resist impact and also helps to keep the glass together if broken.

It is an ideal solution for use in wardrobe doors, full height mirrors, offering oustanding image reproduction with >90% reflectivity.

Valleta™ VS

Where medium level security and discreet observation are a key requirement, venetian striped is the perfect solution.

Valleta™ VS, acting similar to a glass blind when glazed with the stripes running vertically, also creates privacy and a decorative designer feel.

Valleta™ White

Valleta™ White is a white painted designer glass panel with a special vinyl backing applied to the back of the glass to ensure compliance with AS/NZS 2208 Safety Glazing Materials in Buildings; Class A.

Ideally suited for use as wardrobe doors, interior wall panels or as a glass whiteboard using non-permanent marker pens, the product is scratch resistant and easy to clean and maintain.

Maximum sizes

	Valleta™ Mirror	Valleta™ VB	Valleta™ VS	Valleta™ White
3mm Clear	2440 x 1830	N/A	N/A	N/A
4mm Clear	3660 x 2440	2760 x 1220	N/A	2140 x 800 | 2140 x 1070 2760 x 920 | 2760 x 1220
4mm Grey	3660 x 2440	N/A	N/A	N/A
4mm Bronze	3660 x 2134	N/A	N/A	N/A
6mm Clear	3660 x 2440	N/A	2440 x 1830	N/A
6mm Grey	3660 x 2440	N/A	N/A	N/A
6mm Bronze	3210 x 2550	N/A	N/A	N/A

Valleta™ Decorative Silvered Glass

Wall mounting

Prior to wall mounting, the wall surface area should be clean and dry. Avoid mounting directly onto brick walls that have recently been acid washed, as any residual acid may cause damage.

SOLOS Glass recommends the use of pH neutral cure adhesives for wall mounting, as acidic or solvent cure adhesives may cause damage.

When wall mounting larger sized panels it is recommended to use both double sided tape and adhesive glue to ensure the mirror stays in place whilst the glue cures.

In bathroom areas where high levels of moisture are present, it is recommended to run an edge sealant around the mirror to increase protection of the mirror edge.

Benefits

- Perfectly flat mirror with excellent levels of reflectivity
- Exceptional levels of durability
- Range of different colours, thicknesses and types to support extensive use of interior design applications
- Opens up living spaces

Applications

- Bathroom and washroom mirrors
- Gymnasiums, training facilities and dance studios
- Night clubs, bars and restaurants
- Traditional framed mirrors
- Wardrobes and interior wall panels
- Whiteboard

An MHG Company

energy

Glass with unprecedented environmental control

solos glass

see the possibilities

Energy management

The changing role of glass in energy management

Glass has become one of the most important elements in a buildings envelope in terms of its ability to offer passive levels of solar control and thermal insulation; playing a pivotal and cost effective role in a buildings' overall energy management and occupier comfort.

These benefits have become increasingly important as the shift towards reducing energy consumption has led to the development of mandatory minimum energy efficiency measures and performance based building codes for both residential and commercial buildings. In Australia the performance based National Construction Code (NCC) published by the Australian Building Controls Board (ABCB) sets out the minimum performance criteria expected in the design and construction of buildings.

The focus has shifted from solely the performance of the glass to the performance of the overall window system; glass, frame, sealant and fixings. By aiding compliance of the thermal performance provisions of the NCC through its three certified software tools or by facilitating BASIX compliance within NSW, the role that high performance energy efficient glass products such as OptEma™ or CoolRay™ play in supporting the improvement in a buildings overall energy efficient performance are becoming more and more important and can't be understated.

Source: www.abcb.gov.au

Meeting the need for higher performance

Single glazed glass can go some way towards protecting a building from its environmental surroundings and assisting in managing the buildings internal environment. There are a number of glass types available from SOLOS Glass, which when single glazed can help manage the amount of light and heat from entering the building and the amount of heat leaving the building.

However, as energy efficiency provisions become increasingly stringent for both residential and commercial glazing applications and building design seeks to optimise the use of glazed area due to the need to improve levels of natural light, the performance requirements for glass have become increasingly important. Supporting and subsequently driving this change has been the increased use of higher performing Insulating Glass Units (IGU's), especially ones incorporating various types of Low Emissivity glass.

Energy management

Key performance measures

There are 4 key factors used when describing the performance of either a single (monolithic) piece of glass or an Insulating Glass Unit (IGU).

- Visible Light Transmittance (VLT) - The amount of visible light transmitted through the glass. This is represented as a %. A higher number means more light is passing through the glass. The range of visible light transmittance varies across a number of different glass types. The correct level of light in a room creates optimal conditions by which to live and work as well as providing suitable levels of comfort for the eyes. This is in turn contingent on a number of factors including the light transmittance of the glass, the level of glare, the presence of strong shadows as well as the overall orientation of the building

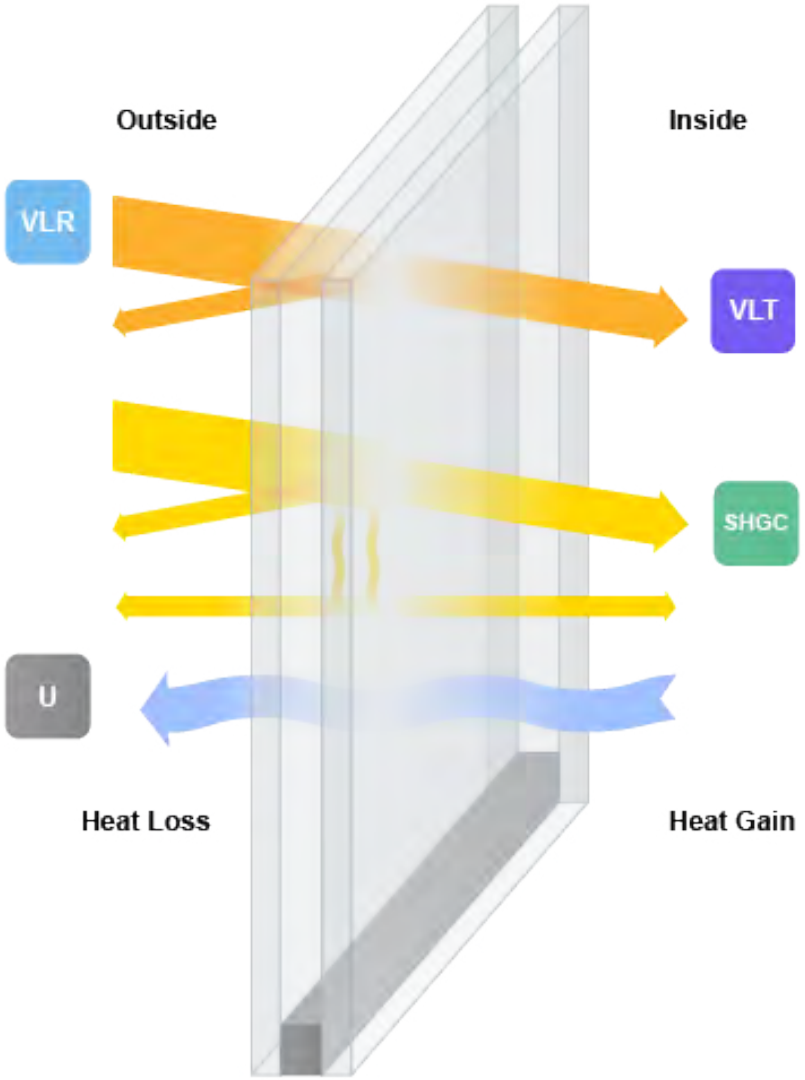
- Solar Heat Gain Coefficient (SHGC) – Glass manages the solar heat gain allowed into a building through the amount of heat it reflects and the amount it absorbs. When solar energy hits the glass surface, some will be reflected away, some will be absorbed and re-radiated back inside the building and some will be directly transmitted

  The total amount of heat transmitted through the glass into the inside of the building is represented by the SHGC. Each glass type has a different SHGC. The lower the number the better the solar control performance of that particular glass product. The use of Toned or coated glass products will invariably have a better SHGC than clear, uncoated glass products, glazed either monolithically or as an IGU

- U Value – A measure of how effective glass (and a glazed window) is in preventing heat transfer. The lower the U Value, the greater the resistance the glass has to heat flow and therefore the better insulator it is. U Value is measured in W/m2k

- Visible Light Reflectance (VLR) - The amount of light which is reflected back away from the glass surface. This is represented by a %, the higher the %, the greater the reflectivity. For energy management the amount of light reflected back out from the external glass surface is required most often

The desired balance across these four elements will determine the type of glass required, the performance of the glazing in managing the internal environment, the degree to which the required levels of comfort are achieved, the level of energy cost reduction achieved and ultimately, especially for commercial buildings, the role of the glazing system in reducing the buildings operational life cycle costs



Energy management

Energy Efficient Glass

From the base level energy efficiency characteristics of EnviroClear™ through to the outstanding overall energy efficiency performance levels of the CoolRay™ range, SOLOS Glass energy efficient glass products are designed to suit a broad spectrum of aesthetics, solar control and thermal insulation performance requirements for residential, commercial or specialist applications.

Whilst most glass types within the SOLOS Glass energy efficient product range can be single glazed, it is as a double glazed unit or IGU that the potential of the solar control and thermal insulation properties of the product range become more fully realised.

Nowhere is that more relevant than the performance characteristics associated with the Commercial range of the CoolRay™ IGU's and the Residential range of OptEma™ Plus IGU's.

The SOLOS Glass product range includes proprietary branded toned and coated energy efficient glass types such as:

EnviroTone™ - For use in single glazing when improved solar control, glare reduction and low reflectivity are required, EnviroTone™ can also be used as one pane within the range of OptEma™ or KlymetControl® IGU's for further enhanced solar control and improved thermal performance. Available annealed, laminated, heat strengthened, toughened or heat soaked, EnviroTone™ is available in a range of colours which offer a range of performance parameters as well as providing a choice of aesthetic.

EnviroTone™ Plus - An extension of the EnviroTone™ range offering significant improvements in the solar control performance of the glazing whilst maintaining excellent levels of glare reduction in combination with low levels of external reflection.

KlymetShield™ - An energy efficient Low E glass range designed for use in either single glazing or as part of the OptEma™ or KlymetControl® IGU range for both residential and commercial applications, KlymetShield™ was specifically introduced to assist in the cost effective improvement of energy efficient building design and the provision of a much more comfortable living and working environment.

SOLOS Glass manufacture 5 different suites of IGU products which are capable of incorporating most types of glass SOLOS Glass offer for an increasing number of different applications:

- The KlymetControl® product range, designed for use in both the residential and the commercial market which incorporates a broad range of glass types dependent on the final performance requirements.
- The KlymetControl® Plus product range which incorporates OptEseal™, a warm edge spacer solution for superior thermal insulation performance, improved structural strength and enhanced durability.
- The OptEma™ product range, a superior performing IGU incorporating a specialised Low E glass particularly suited for specifically for the residential market.
- The OptEma™ Plus product range which incorporates OptEseal™, a warm edge spacer solution for superior thermal insulation performance when glazed in a selected range of window and door suites.

CoolRay™ - The CoolRay™ product range, providing exceptional selectivity as well as low U values and a neutral appearance. CoolRay™ is particularly suitable for medium to high rise curtain walls and facades

SOLOS Glass are also proud to be a stockist and supplier of a number of products sourced from some of leading glass manufacturers and suppliers in the Region, either for single glazing or as components within our range of IGU's ; products including:

- EnergyTech[1]
- SolTech[1]
- EVantage[1]
- Stopsol[2]

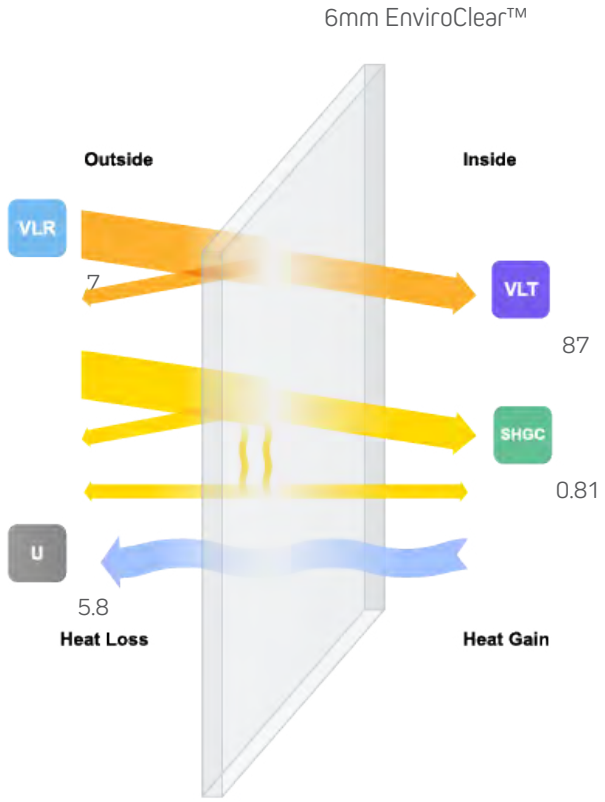
Energy management

How different SOLOS Glass products help to manage energy

EnviroClear™ Float

Whilst suitable for most glass and glazing applications in either a cut size or processed form and available in thicknesses of between 2mm through 19mm, single glazed EnviroClear™ float glass provides limited benefits with regards to reducing the solar heat gain or improving the thermal insulation of a building. When a safety glass is required EnviroClear™ is readily available in a range of processed glass types including toughened. (as TufGlas™) laminated (as Protekta™) or heat soaked (as TufGlas™ HSK) all supplied to the relevant Australian standard.

As well as being the base component in a number of SOLOS Glass processed glass products, EnviroClear™ is also commonly used as either the external or internal glass pane within one of the range of SOLOS Glass Insulated Glass Units in either annealed, heat treated or laminated form.



EnviroClear™ single glazed performance data

Nominal thickness	Visible Light (%)		Solar Energy (%)		UV Trans. (%)	SHGC	U Value
	Trans.	Refl.	Trans.	Refl.			
4mm	89	8	82	8	67	0.85	5.90
5mm	89	8	79	7	63	0.83	5.80
6mm	88	8	78	7	60	0.82	5.80
8mm	86	8	71	7	56	0.78	5.70
10mm	85	8	67	7	52	0.75	5.70
12mm	84	8	64	7	48	0.73	5.60
15mm	84	8	65	7	47	0.76	5.50
19mm	82	8	61	6	43	0.72	5.40

Energy management

KristalClear™ Low Iron Glass

KristalClear™ is a low iron float glass which consistently provides exceptional levels of transparency, light transmission, clarity and brilliance not found in standard clear float glass of comparable thickness. Manufactured in the same way as standard float glass, the extra clarity inherent to KristalClear™ is achieved by using a silica/sand component in which nearly all the iron has been removed. The result is a product which does not have the 'dark green edge' often associated with standard float glass and which has almost identical levels of light transmittance regardless of thickness.

Available in thicknesses from 4mm through 19mm, KristalClear™ Low Iron float glass is a specialist ultra clear glass mainly used in retail glazing, splashbacks, furniture, glass shelving and many applications where the reproduction of true colours and/or maximum visual impact is required.

KristalClear™ is becoming increasingly considered for use as the external pane of an IGU in residential window applications in Australia's colder climate zones where the high levels of light and solar heat transmittance also allow for the highest possible levels of free passive solar heat gain to be offered during the colder Winter months. Using KristalClear™ as the external pane of an IGU from within the KlymetControl® and OptEma™ product ranges enables increased levels of free energy from the sun to be harnessed and captured all the year round, providing enhanced energy efficiency and reduced reliance on artificial heating systems.

The trueness of colour and high levels of natural light transmission also help provide outstanding levels of clarity of vision when beautiful views are highly valued.

KristalClear™ single glazed performance data

Nominal thickness	Visible Light (%)		Solar Energy (%)		UV Trans. (%)	SHGC	U Value
	Trans.	Refl.	Trans.	Refl.			
4mm	91	9	90	8	78	0.90	5.90
5mm	91	9	89	8	72	0.90	5.90
6mm	91	9	88	8	74	0.89	5.80
10mm	90	9	86	8	66	0.88	5.70
12mm	90	9	86	8	66	0.88	5.60
15mm	90	9	83	8	57	0.86	5.50
19mm	90	9	82	8	54	0.85	5.40

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CoolRay™

High Performance Insulated Glass

solos glass

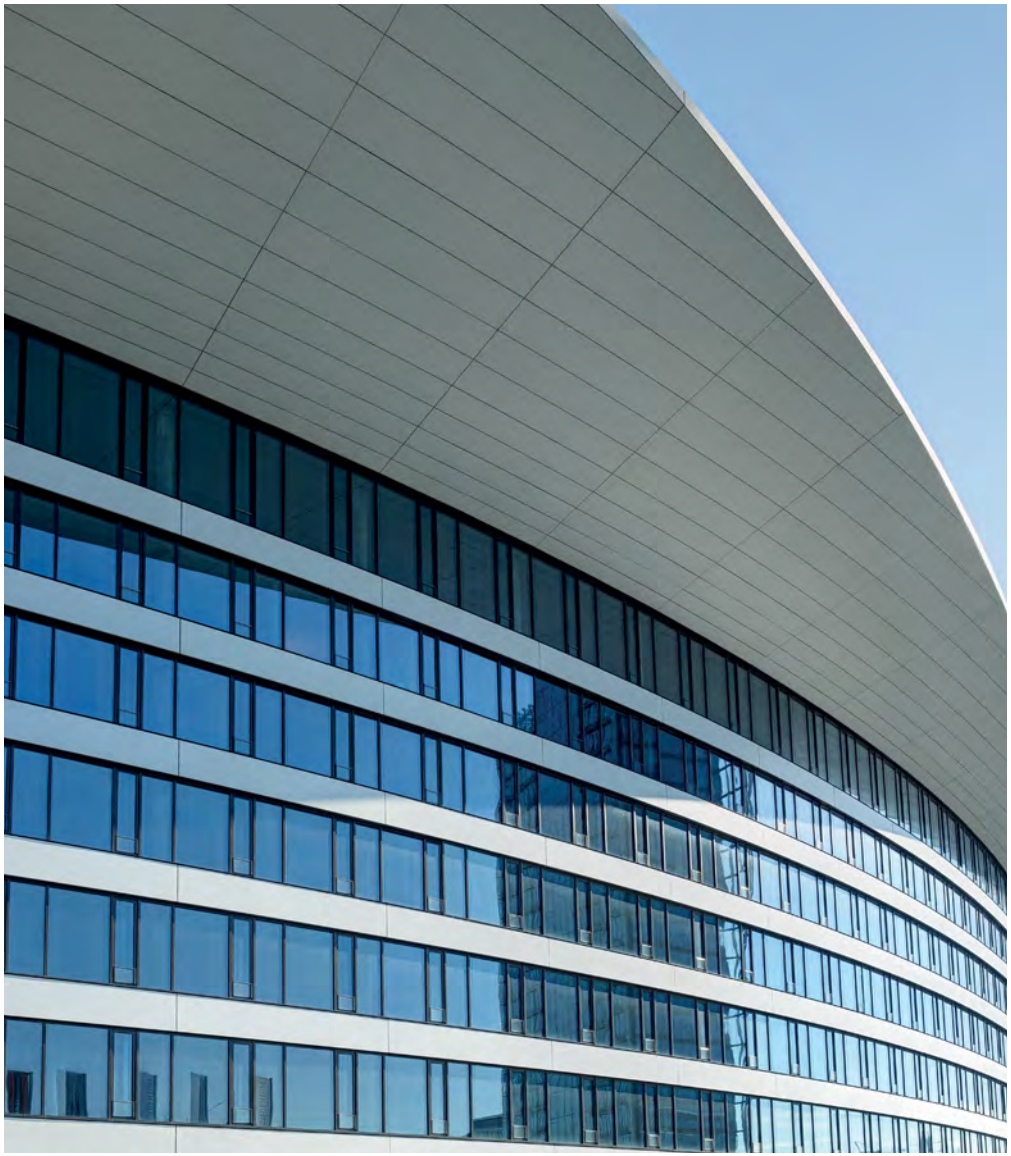
see the possibilities

CoolRay™ High Performance Insulated Glass

Environmental control

CoolRay™ is designed to allow high levels of light transmittance in combination with low levels of solar heat gain and an excellent low U Value.

CoolRay™ offers superior solar control and energy efficiency performance along with outstanding neutral aesthetics. Particularly suited for medium to high rise facades and curtain walls, the high performance characteristics of CoolRay™ provide architects and designers with exceptional functionality and excellent design flexibility.



Benefits

- High light transmission
- Excellent VLT to SHGC ratio (selectivity)
- Low U value of 1.3 W/m²K
- High degree of aesthetic neutrality both in transmission and reflection
- Large IGU sizes available
- Outstanding management of the levels of internal comfort, reduced solar heat gain, optimum internal lighting and overall energy efficiency
- Can be combined with a number of specialist products to provide additional acoustic, decorative and security solutions for a wide range of applications

Applications

- Curtain walls
- Medium to high rise facades

CoolRay™ High Performance Insulated Glass

High performance, solar control insulated glass

Incorporating a high performance Low E coating encapsulated within the IGU itself, CoolRay™ is able to balance all of its key performance attributes to offer high levels of energy efficiency and continual passive control of the internal environment all year round.

By significantly reducing solar heat gain during warmer months and minimising heat loss in cooler months, CoolRay™ provides a comfortable living space and facilitates a reduction in overall energy costs without compromising on the level of available light transmittance.

The CoolRay™ range

With four distinct levels of performance, the individuality of each products selectivity is supported by exceptional neutrality combined with consistently low U Values.

Available as heat treated (heat strengthened and toughened) IGU's in a maximum size of up to 6000mm x 3210mm, CoolRay™ IGU's are supplied with 90% argon fill as standard and are available with either a black aluminium or high performance OptEseal™ warm edge spacer. The Low E coated glass component of the CoolRay™ IGU is available in 6mm, 8mm* or 10mm* thicknesses as standard.

Product	Norm	VLT (%)	SHGC (%)	External Light Reflectance LRe (%)	Internal Light Reflectance LRi (%)	U-Value (W/m^2k) 12mm Argon
CoolRay™ 70	NFRC	68	0.33	13	15	1.3
CoolRay™ 60	NFRC	60	0.31	16	17	1.3
CoolRay™ 50	NFRC	50	0.25	18	22	1.3
CoolRay™ 40	NFRC	41	0.21	20	15	1.3

Performance data based on 6mm CoolRay™ / 12mm Argon / 6mm EnviroClear™ IGU with aluminium spacer and coating on surface #2; measured to NFRC 100. *Contact us to discuss contractual volume requirements.

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EnviroTone™

Solar Control Toned Glass

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EnviroTone™ Solar Control Toned Glass

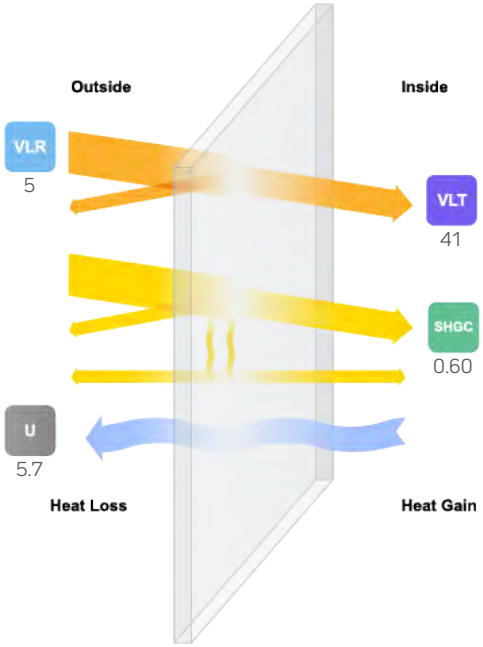
EnviroTone™

EnviroTone™ float glass provides a level of solar control which helps to manage both the aesthetic appearance of the building and the improvement of the buildings energy management performance. Achieved through the reduction of solar heat gain without the need for significant additional reflectivity, EnviroTone™ also reduces both UV penetration and glare to the inside of the building.

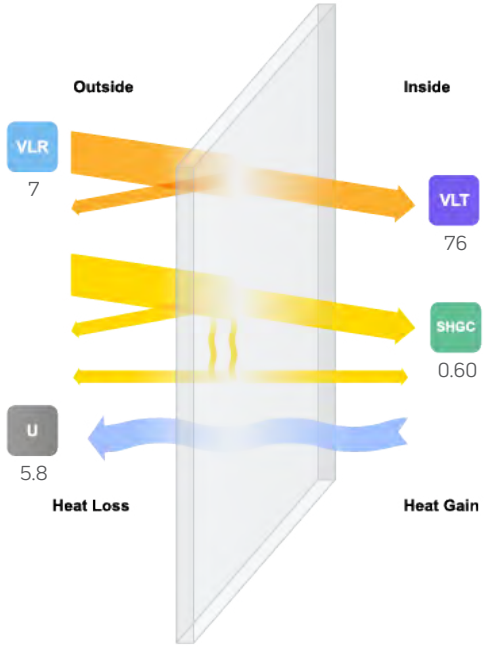
Manufactured by adding different chemicals and metal oxides to the batch during the float glass manufacturing process, the EnviroTone™ range of toned glass reduces the solar heat gain by absorbing solar energy within the body of the glass.

Different colours absorb solar energy to different levels; the darker the glass, the more heat that is absorbed. As such, it's often the case that toned glass products have to be heat treated (either toughening or heat strengthening) to avoid breakage through thermal stress.

6mm EnviroTone™ Grey



6mm EnviroTone™ Green



EnviroTone™ Solar Control Toned Glass

Common tones are grey, bronze and green which are available in 4mm through 12mm* (*Grey only).

The tone and light transmission of the glass will differ dependent on the glass's thickness, i.e. 10mm grey toned glass will appear darker than 6mm toned glass and will have a lower light transmission.

All EnviroTone™ glass is easily toughened, laminated and processed and can be glazed monolithically or as part of a KlymetControl® IGU. Incorporating the glass into a KlymetControl® IGU will improve the solar and thermal performance of the product over an IGU made up of just clear float glass, especially when used in conjunction with KlymetShield™ Low E glass as the inner pane.

EnviroTone™ single glazed performance data

Product name	Nominal thickness	Visible Light (%)		Solar Energy (%)		UV Trans. (%)	SHGC	U Value
		Trans.	Refl.	Trans.	Refl.			
Toughened and annealed								
EnviroTone™ Grey	4mm	56	6	55	6	29	0.67	5.90
	5mm	50	5	47	5	27	0.66	5.80
	6mm	42	5	42	5	19	0.58	5.80
	10mm	26	4	28	4	10	0.50	5.70
	12mm	21	4	25	5	9	0.47	5.60
EnviroTone™ Green	4mm	82	8	58	6	36	0.69	5.90
	5mm	77	7	47	6	20	0.62	5.80
	6mm	75	7	44	6	26	0.59	5.80
	10mm	66	6	31	5	15	0.52	5.70
EnviroTone™ Bronze	4mm	61	7	60	6	28	0.70	5.90
	5mm	56	6	57	6	24	0.69	5.80
	6mm	51	5	52	5	19	0.65	5.80
	10mm	34	5	36	5	9	0.55	5.70

EnviroTone™ Solar Control Toned Glass

EnviroTone™ higher performing tones

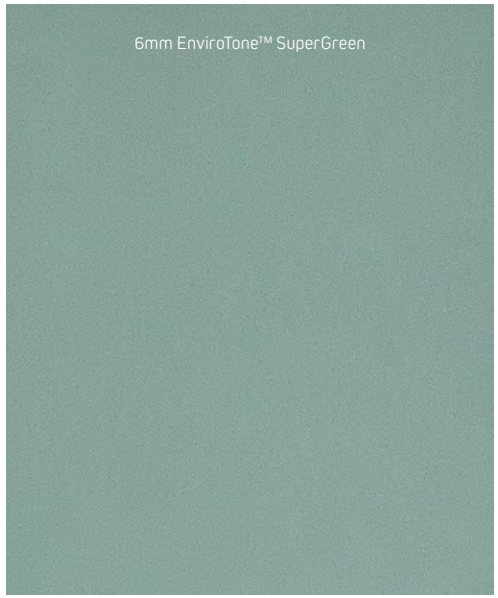
The EnviroTone™ higher performing tones provide richer colours and an improved SHGC in combination with low internal and external reflectance when compared to standard EnviroTone™. This not only improves the solar control performance of the glass but also assists in maintaining natural views when looking from the interior of the building.

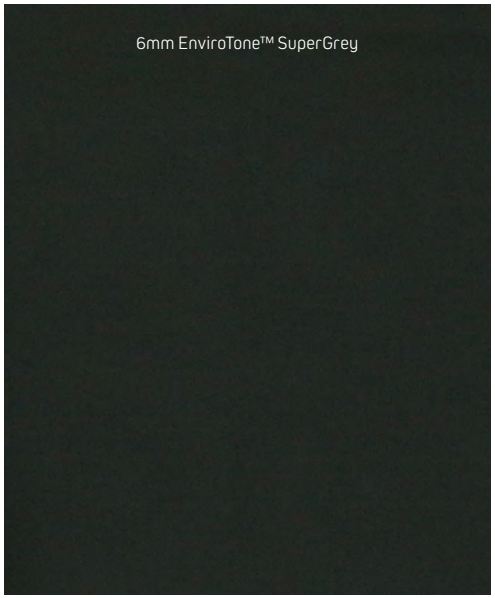
The standard range of EnviroTone™ higher performing tones are:

- SuperGreen
- SuperGrey
- SuperBlue

Because these higher performing tones absorb more heat than standard tones, it is advised that a thermal safety check is undertaken prior to finalising the order to confirm whether the glass needs heat treating. Certainly SOLOS Glass recommends that EnviroTone™ SuperGrey, with a VLT of 9%, is heat treated for every application due to the large amount of heat it absorbs.

Both EnviroTone™ SuperGreen and EnviroTone™ SuperBlue offer excellent VLT for the level of SHGC performance provided. EnviroTone™ SuperGrey, with its deep cool grey colour is ideal for where additional privacy is required and reducing glare is a priority.





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EnviroTone™ Plus

High Performance Toned Glass

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EnviroTone™ Plus High Performance Toned Glass

Coated glass products

Whilst EnviroTone™ and EnviroTone™ Plus provide excellent and cost effective solar control benefits, glazed either monolithically or as part of an IGU, their performance boundaries are often set by their reliance on the different tones inherent within the respective product to control the amount of light and heat transmitted into the building.

Where higher levels of solar radiation control performance are required from the glass, different types of coated glass can be used to both reflect and absorb higher levels of solar radiation as well as providing an improved balance between the desired aesthetics and the cost effective energy management of a building.

Increasingly however, the demands placed on both the glass and the overall window installation to improve overall energy efficiency has driven increased use of Low Emissivity (Low E) coated glass.

The development and increased use of of Low E glass technology in both commercial and residential windows and doors, especially when incorporated with other glass types within an Insulated Glass Unit (IGU), has improved the glass' overall ability to filter the levels of visible light and heat entering (VLT & SHGC) through the glazing as well as helping to manage the amount of heat escaping (U value) from the building to the outside.

See the SOLOS Glass Performance Guide for further information.

'There are both similarities and significant differences between the way that coated glass is manufactured depending on both the type of coated glass and the performance characteristics required.

Each type of coating is distinctly different and the methods of applying the coatings equally so. The resultant coated glass types each have different properties, benefits and levels of performance criteria as well as differing in the way that they can be processed and subsequently fabricated.

Coated glass can be manufactured by two distinctly different methods:

- 'Pyrolitic' or on-line (hard) coated products
- 'Sputtered' or off-line (soft) coated products.

Coated glass performance data

Glass Product	Normal Thickness	Visible Light Trans.	Visible Light Refl. Out	Visible Light Trans.	Visible Light Refl.	UV Trans.	U-value W/m2-C	SHGC	Shading Co.
EnviroTone™ Plus									
Grey	6	9	4	8	4	1	5.8	0.35	0.41
Green	6	65	8	33	6	13	5.7	0.51	0.58
Blue	6	53	6	33	5	23	5.8	0.52	0.60
Dark Grey	5	20	5	39	5	40	5.8	0.57	0.65

*All four glasses offer excellent performance when glazed as part of a KlymetControl® IGU in combination with a KlymetShield™ Low E glass. See the SOLOS Glass Performance Guide for further information.

EnviroTone™ Plus High Performance Toned Glass

The manufacture of On Line (Pyrolitic) coated glass

The manufacture of hard coated, on line pyrolitic coated glass is achieved by depositing micro thin coatings of different metallic oxides on the glass surface during the float glass manufacturing process. This process is commonly known as chemical vapour deposition or CVD.

By this method the coating actually becomes part of the glass during the annealing or cooling phase of glass manufacture. The resulting coated glass products are extremely hard and durable enabling the glass to be handled, cut and processed as per normal uncoated glass as well as enabling the glass to be single glazed.

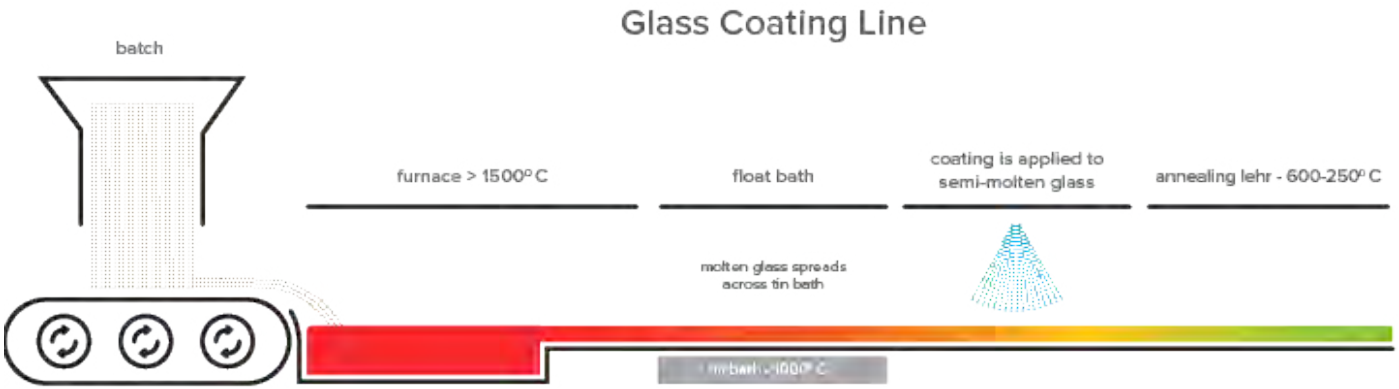
This process manufactures both reflective solar control products such as SolarFlex[3] and hard coated clear and toned Low E products such as KlymetShield™, SolTech[1] and EVantage[1]. Whilst reflective solar control products are usually only used in medium and high rise commercial applications, hard coated Low E products are extensively used in both commercial or residential applications in both single and double glazed form.

In Commercial applications this has been riven by initiatives such as NABERS and Green Star as well as by changes to Section J of the National Construction Code of Australia, as well as the increasing demand for more energy efficient buildings from building occupiers and tenants.

In Residential applications the use of coated Low E glass products has become more popular recently as legislative requirements tighten, specifically with regards to achieving specific energy ratings for windows for home design and as the cost of gas and electricity continues to rise.

Also, with increased awareness of the role that glass plays in both the overall heating and cooling performance of the home, the desire to add value to the home whilst improving the internal environment and the overall comfort of the home has become increasingly popular.

Whilst KlymetShield™ (in annealed, toughened or laminated form), can be used as a single glazed product, the desire to provide maximum possible overall window performance has seen a shift towards the installation of IGU's, such as KlymetControl®, which can incorporate a range of Low E products depending on the overall performance required.



EnviroTone™ Plus High Performance Toned Glass

Reflective coated solar control glass

The range of SOLOS Glass reflective solar control products are supplied as processed single glazed products or as part of a KlymetControl® IGU mainly for use in external windows or building facades in low to medium rise commercial projects.

The purpose of the reflective coatings associated with each product is to reflect and absorb a majority of the sun's direct short wave radiation, reducing the amount of heat gain into the building and providing superior solar control than that available with clear or standard toned products.

The SOLOS Glass Reflective Coating Glass Range

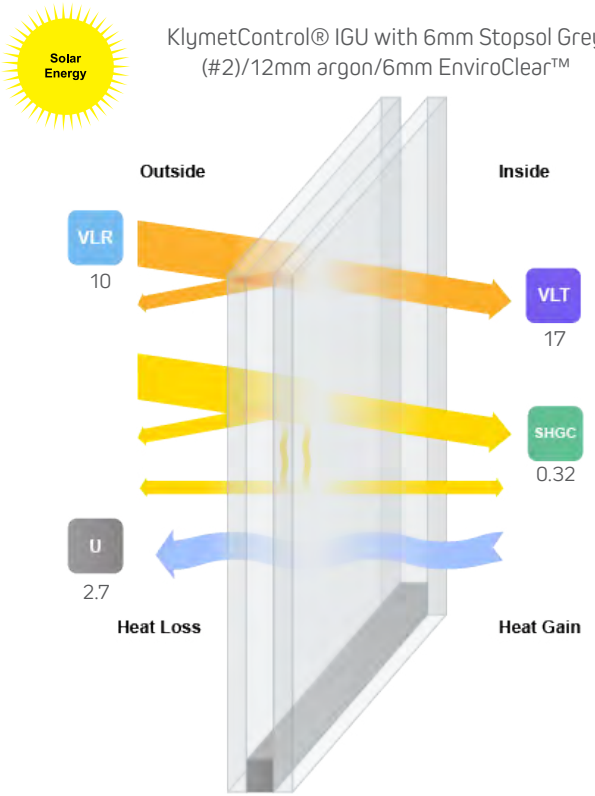
Product	Normal Thickness	Visible Light		Solar Energy		UV	U-value 12mmArgon	SHGC	Shading Co.
		Trans.	Refl.	Trans.	Refl.	Trans.			
Stopsol² Bronze	4+12+4	24	16	32	15	8	2.6	0.43	0.49
	6+12+6	20	12	25	11	4	2.7	0.34	0.39
Stopsol² Grey	4+12+4	22	14	30	14	8	2.6	0.41	0.47
	6+12+6	17	10	32	10	5	2.7	0.32	0.37
SolarFlex³ Blue	6+12+6	8	17	17	14	3	2.8	0.17	0.20

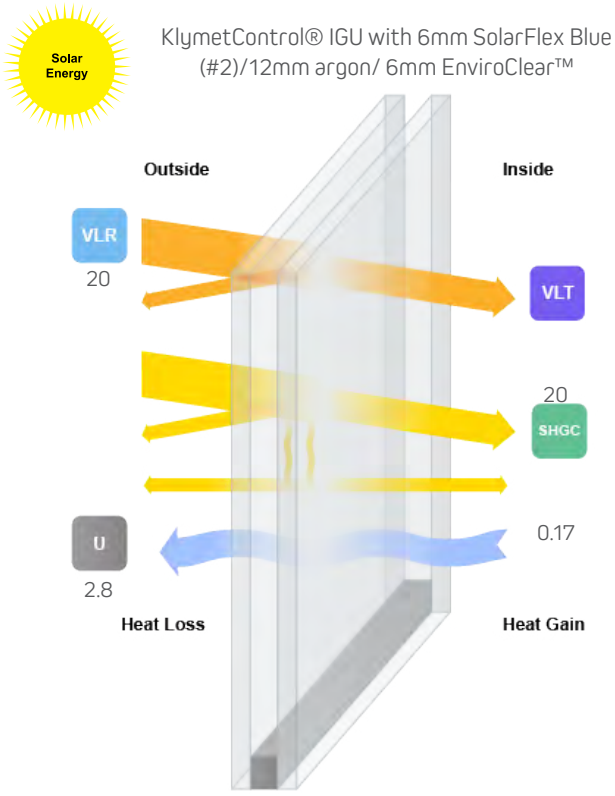
EnviroTone™ Plus High Performance Toned Glass

Reflective Coated Solar Control Glass

The role and performance of reflective solar control glass provides an ideal solution for commercial glazing applications where a specific performance criteria and/or aesthetic look is required. By offering varying levels of reflectivity combined with a range of different coloured glass substrates, not only can the amount of solar heat transmission and therefore the solar heat gain into a building be reduced, but suitable levels of light transmission can be also allowed into the building in combination with effective glare control, excellent levels of privacy and a dynamic external appearance which changes in conjunction with its surroundings.

Reflective solar control glasses can provide effective levels of energy management, especially when glazed in conjunction with a low emissivity glass within a KlymetControl® IGU and play an important role in providing a range of unique performance and design benefits. However, as the need to better balance the levels of light transmittance, solar heat gain and thermal insulation becomes increasingly prevalent, products offering coatings which combine both solar control and low emissivity properties are becoming more and more popular





EnviroTone™ Plus High Performance Toned Glass

Solar Control with Low E Glass

The increased demand for energy efficient coated glass products within both commercial and residential buildings across Australia in recent years has seen the development of both clear and solar control coated glass products with low emissivity (Low E) characteristics which provide both moderate to high levels of solar control, excellent daylight transmission, lower levels of reflectivity and high levels of thermal insulation.

SOLOS Glass offers a number of different Low E glass products which offer a range of performance levels dependent on the application and the aesthetic or overall level of energy efficiency required.

Each Low E glass based solution provides different performance parameters with regards to the balance across SHGC, light transmission and thermal insulation. As such, with such a broad range of solutions on offer, the designer or specifier has a number of choices when choosing a buildings appearance as well as its performance characteristics.

What is Low Emissivity?

Low Emissivity describes the ability of a surface, in this case the surface of the glass, to both absorb and re-radiate heat. The lower the emissivity of the glass, the less heat is absorbed by the glass and re-radiated, or emitted, from the warm side of the glass to the cold side of the glass.

Low Emissivity glass essentially has two key roles:

- Improve the overall insulation performance of the glazing. As implied by then term, because Low E glass has a low emissivity and therefore a low U value, it acts as good insulator, reflecting heat back into the room and reducing heat loss. This function is particularly important in cool or cold climates where the insulation of the building and the reduction of heat loss is of prime concern.
- Enhance the overall solar control properties of the glazing, especially when the coating is applied to one surface of a solar control glass. If a solar control glass has a Low E coating applied, for example KlymetShield™ Grey, the coating helps reflect out the heat which has been absorbed within the substrate of the solar control glass, assisting in reducing the overall amount of heat transferring from the outside to the inside; ie, reducing the Solar Heat Gain Co-efficient (SHGC). In such circumstances the coating would still be on surface 2 if the glass was single glazed (Hard coated Pyrolitic Low E glass types only).

  The coating would also be on surface 2 if glazed as part of an IGU, regardless of whether the Low E was a ‘hard’ or a ‘soft’ coat.

Measuring Emissivity

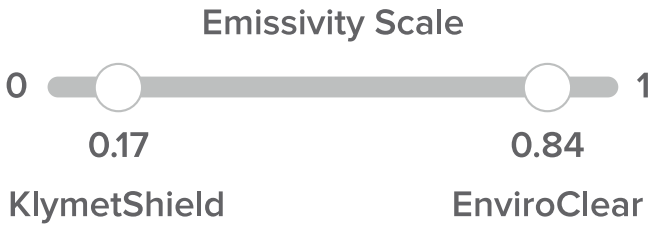
Measured on a scale of 0-1, the lower the emissivity of the glass, the lower the U value and the better the insulation.

If the emissivity of a single piece of 4mm EnviroClear™ clear float glass is compared with that of a single piece of 4mm KlymetShield™ Low E glass, it can be seen that:

EnviroClear™ standard clear float glass has an emissivity of 0.84, which is very high, meaning that uncoated standard clear float is a very poor insulator.

KlymetShield™, a pyrolitic coated Low E glass, has an emissivity of 0.17 which is very low in comparison. This indicates that only 17% of the heat hitting the surface of the glass is absorbed and re-emitted to the cold side of the glass with 83% of the heat being reflected back to the room side.

KlymetShield™ is therefore a far better insulator than EnviroClear™ and, by inherently having a lower U value, reduces the amount of heat which escapes from the room to the outside, or, indeed, reduces the amount of heat which can be transmitted from the outside to the inside.



An MHG Company

KlymetControl®

Insulated Glass Solutions

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KlymetControl® Insulated Glass Solutions

SOLOS Glass are one of Australia's earliest and largest manufacturers of IGU's, so the KlymetControl® brand comes with a long history of both manufacturing excellence and installation longevity.

All KlymetControl® IGU's are manufactured to both AS 4666 and EN 1279 Pt 2 and are widely used across a broad range of both Commercial and Residential window applications. KlymetControl® IGU's are manufactured with argon gas fill as standard for superior energy efficiency performance.

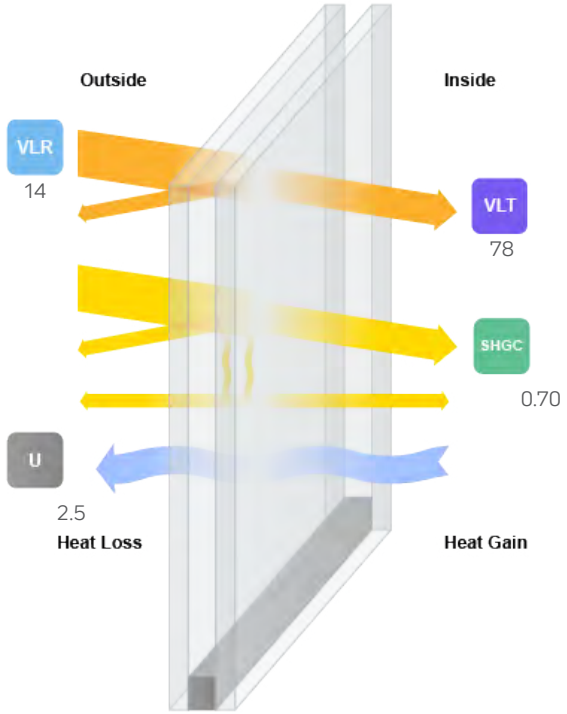
Commercial Applications

Available in a wide range of product combinations to help manage the availability of suitable levels of natural light in conjunction with achieving the required levels of both solar control and thermal insulation, KlymetControl® is a range of Insulated Glass Units (IGU's) incorporating high performing specialist glass products sourced from some of the World's leading glass manufacturers.

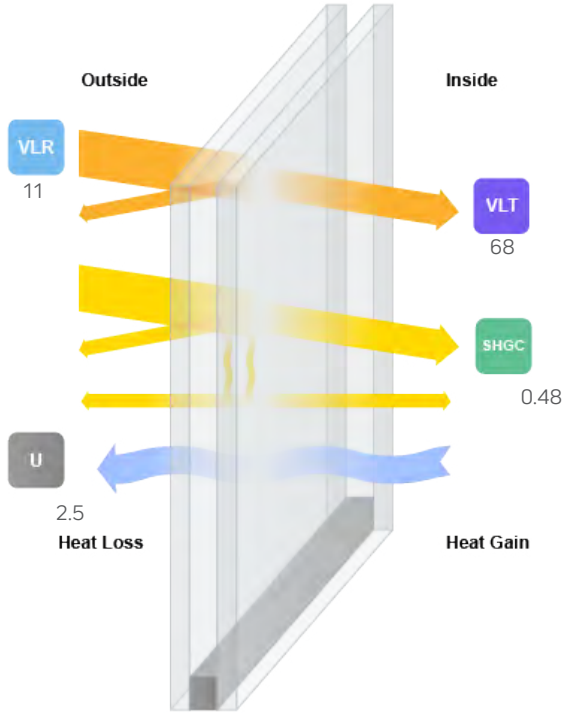
Click here to view performance data for our range of Commercial IGU's

Helping to provide reduced heating and cooling costs by improving both the SHGC and, through effectively helping to manage the U Value, the thermal insulation of the building, KlymetControl® can achieve excellent levels of both energy efficiency and occupier comfort.

6mm EnviroClear™ / 12mm / 6mm EnviroClear™



6mm EnviroTone™ SuperGreen / 12mm / 6mm EnviroClear™



KlymetControl® Insulated Glass Solutions

As such, KlymetControl® helps achieve a balanced living and working space for the buildings occupants, as well as helping to provide economically viable and sustainable buildings.

By incorporating different glass types from across the SOLOS Glass product range within a KlymetControl® IGU, a number of additional benefits can also be achieved, including improved:

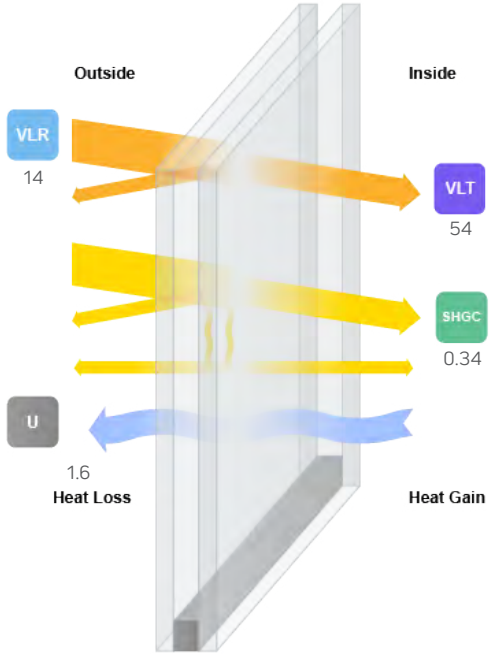
- Noise reduction – Silencia™
- Safety – Protekta™, TufGlas™
- Security – SecurView™
- Aesthetics – Chroma™, EnVision™

Further, with the incorporation of KlymetShield™ or other Low E glass types within the KlymetControl® glass make-up, further enhanced overall energy management is easily and cost effectively achievable.

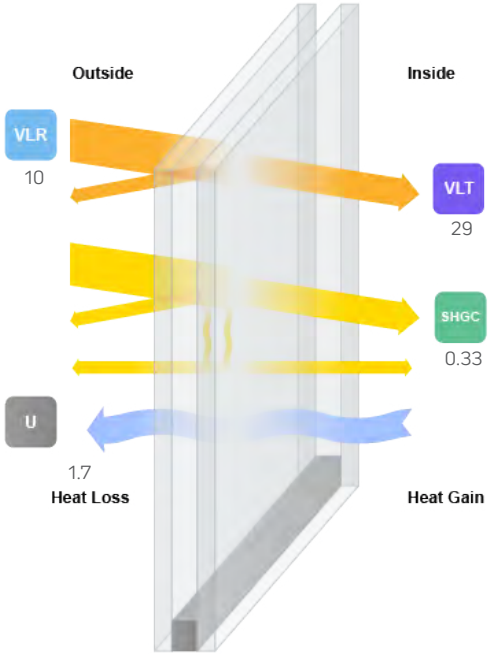
Applications

- Atriums
- Airports
- Car showrooms
- Commercial medium and high rise facades
- Hospitals
- Sports stadiums
- Shopping Centres

6mm EnviroTone™ SuperGreen/12mm/6mm KlymetShield™



6mm EVantage[1] Grey*/12mm/6mm EnviroClear™



KlymetControl® Insulated Glass Solutions

Residential Buildings

The role that glass plays in managing the internal environment of the home is becoming increasingly important.

Selecting the most appropriate glass type to not only provide year round comfort but to also assist in improving the overall energy efficiency, safety and security of the home is one of the most important decisions to make for either a new build or home improvement/renovation project.

KlymetControl® – Some Key Features

Properly selected and installed windows incorporating KlymetControl® Insulating Glass Units (IGU's) assist in helping to control the level of natural light entering the home whilst:

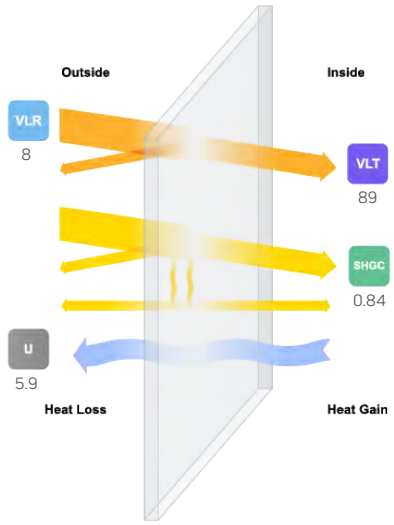
- Improving the overall comfort and energy efficiency of the home
- Reducing both heating and cooling costs
- Improving the overall star rating of a residential window
- Reducing unwanted solar glare
- Reducing noise from a variety of sources
- Maximising the available living space within the home
- Increasing the levels of both safety and security within the home

KlymetControl® IGU's - Helping to manage the Australian climate all year round

With standard clear glass in the windows, especially in single glazed windows, the cool and cold temperatures of Winter and hot temperatures of Summer can accentuate this fluctuation and compound a lack of comfort, as well as significantly higher energy bills.

Whilst the temperature cycle of Australia's colder and more temperate climates, for example in Tasmania, ACT, Victoria and some parts of NSW can fluctuate significantly depending on the season or time of year, the temperature range within which we as householders feel comfortable in is comparatively narrow.

4mm EnviroClear™



4mm EnviroClear™ / 12mm / 4mm KlymetShield™ (#3)

KlymetControl® Insulated Glass Solutions

Reduces heat loss

Even when using clear glass in the IGU, KlymetControl® offers over a 50% improvement in thermal insulation performance over a clear, single glazed option.

Improve that by a further 30% by incorporating KlymetShield™ low E glass as one of the panes of glass and the benefits of installing KlymetControl® start to become apparent.

For optimum performance in reducing heat loss from the building, the Low E coating is usually placed on surface 3 of the IGU.

Reducing heat gain

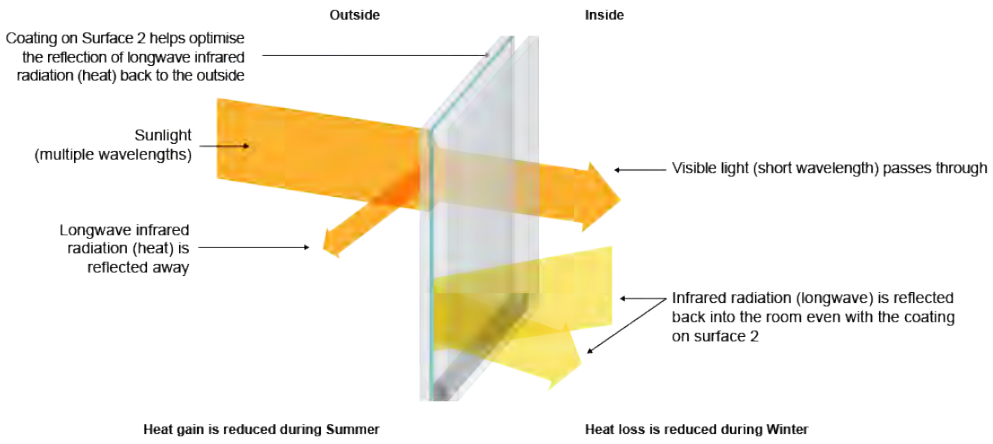
In both the tropical and subtropical climate zones and the hot summer months of the more temperate climate zones, the main performance requirements involve reducing any heat transfer from the outside to the inside of the building, helping to maintain a cooler internal environment inside the building. The performance of KlymetControl® in reducing solar heat gain can be enhanced by using a solar control glass, for example EnviroTone™, as the outer pane.

Alternatively, a reduction in solar heat gain can also be achieved through the incorporation of either a clear or toned KlymetShield™ Low E glass as the outer pane of the IGU with the coating facing the air space on surface 2. Placing the Low E coating on surface 2 helps to reflect a higher percentage of the heat energy and improves the solar heat gain and thermal performance of the window.

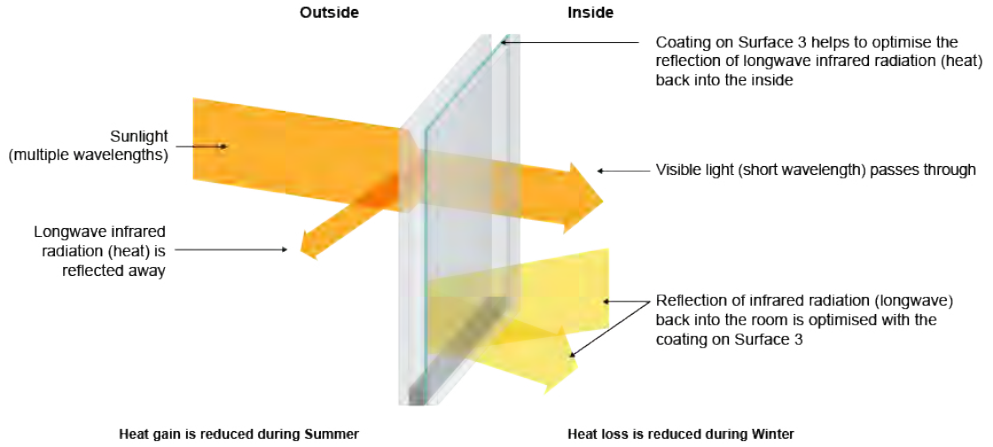
The Location of the Low E Coating

The Low E coating is located on either surface 2 or 3 inside the unit depending on the glass combination and performance required, although the Low E coating is usually placed on surface 2 to reduce the solar heat gain (SHGC) into the building and surface 3 to improve the U value and overall thermal insulation.

KlymetControl® IGU with Low E Coating on Surface #2



KlymetControl® IGU with Low E Coating on Surface #3



KlymetControl® Insulated Glass Solutions

It isn't just about improved comfort and energy efficiency, but providing a whole host of other benefits too

One of the advantages of having KlymetControl® Insulated Glass Units specified and installed is that by incorporating two panes of glass, as well as a choice of air space options, the unit can be custom manufactured to offer a whole range of benefits unique to the particular application into which it is being glazed.

As such, KlymetControl® can effectively assist the householder in providing alternative options to a number of problematic areas often associated with glazed areas:

- Noise Reduction – Whilst IGU's by themselves can't provide significant noise reduction performance until the air space approaches 100mm (impractical in most circumstances), incorporation of a pane of Silencia™ as part of the IGU make-up significantly reduces the transmission of unwanted noise through the glazing and plays a key role in providing a residential sound management solution. This is the perfect solution to reducing traffic, rail or aircraft noise; the distance from the source, the type of noise and the desired internal noise level all playing key roles in determining the correct thickness of Silencia™ to be used
- Security – Minimising the risk associated with unwanted forced intruder entry is one of the main concerns of any householder. Incorporating a pane of SecurView™ laminated glass into the KlymetControl® IGU will provide a much stronger barrier to intruder entry due to SecurView™ incorporating an interlayer which is 4x thicker than standard Protekta™ laminated safety glass. Whilst a KlymetControl® IGU incorporating Protekta™ laminated glass is 20x more difficult to break through than an IGU incorporating standard float glass, for applications where additional security maybe preferred, such as windows to a home office, computer room, home studio etc, incorporating SecurView™ into a KlymetControl® IGU is a perfect solution
- Safety – where the glazing needs to meet the requirements of "AS/NZ 2208 – Safety glazing materials in buildings" there is a need to incorporate one or more of the SOLOS Glass range of safety glass types. KlymetControl® can accommodate any one of the TufGlas™ and/or Protekta™ glass range to provide a suitable level of human impact resistance across a broad range of applications such as low level windows and doors, patio doors, sliding doors and rooflights

Benefits

- All KlymetControl® IGU's are manufactured to both AS 4666 and EN 1279 Pt 2, backed by the SOLOS Glass 5 year manufacturer's warranty for peace of mind
- Excellent range of overall performance attributes. See our Performance Data for more details
- Can be manufactured using either an aluminium or OptEseal™ warm edge flexible silicone spacer for even greater control of overall energy efficiency performance
- Can be manufactured using most glass types across the SOLOS Glass product range for a broad range of applications, solutions and designs
- Further enhanced insulation and reduced energy costs through the incorporation of KlymetShield™ Low E glass or any one of the range of SOLOS Glass low emissivity glass types.
- Exceptional levels of safety and security available through the incorporation of Protekta™, TufGlas™ and SecurView™ to meet the requirements of AS/NZS 2208
- By incorporating Silencia™ as one or more panels of glass within the IGU, a broad range of noise reduction performance levels are possible to mitigate the transfer of traffic, rail and aircraft noise
- Can be manufactured in a range of shapes in accordance with the SOLOS Glass Custom Shape Catalogue

Applications

- Door sidelights
- External windows and doors
- New build and retrofit projects
- Rooflights

Maximum Size

6000mm x 3210mm

Minimum Size

180mm x 350mm

Maximum Weight

800kg

Spacer Widths

6mm, 8mm, 10mm, 12mm, 16mm and 20mm

An MHG Company

KlymetControl® Plus

Superior Insulated Glass Solutions

solos glass
see the possibilities

KlymetControl® Plus Superior Insulated Glass Solutions

Taking on the toughest commercial glazing demands

Even over the course of one year, both residential and commercial glazing systems not only face widely fluctuating temperatures, but they are bombarded with high levels of UV rays, barometric pressure changes, strong winds, driving rain and a wide range of humidity levels. Multiply that over time and the need for an IGU to provide structural strength and durability as well as outstanding levels of thermal performance becomes increasingly apparent.

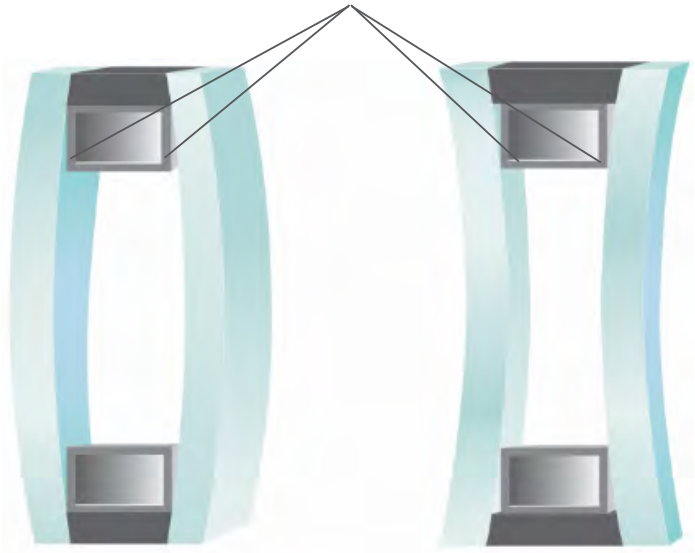
The KlymetControl® Plus IGU range, incorporating the OptEseal™ warm edge spacer, takes on the toughest glazing conditions and gives any window an advantage in reducing energy costs and ensuring enhanced sustainability, durability and stability as well as providing outstanding comfort to any environment.

KlymetControl® Plus – the IGU with the built in memory

Because the technology behind our OptEseal™ spacer is based on thermoset polymers incorporating crosslinks which become permanently set during manufacture, OptEseal™ has 100% memory which means it can't be re-shaped subsequent to the heating, cooling and re-heating cycle. Whilst OptEseal™ expands and contracts on a daily basis as environmental conditions change, it will always return to its original shape. Not so rigid spacers, such as aluminium, which fail to compensate for the natural expansion and contraction that occurs on a daily basis, which may in turn induce edge seal stress, stress cracks and eventual premature seal failure.

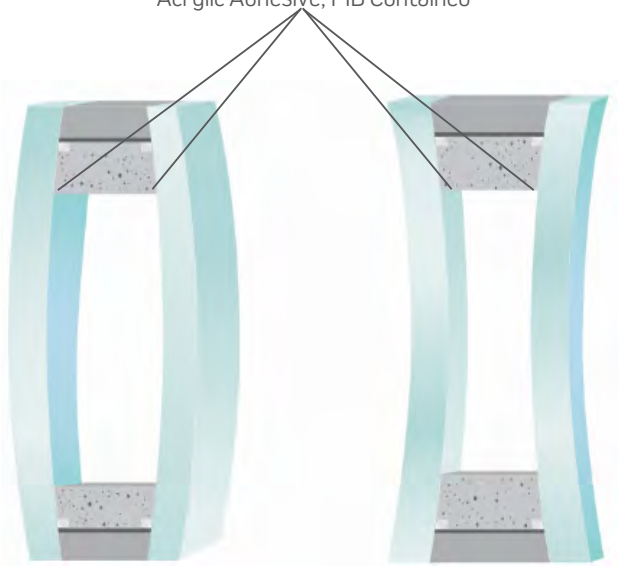
IGU with aluminium spacer

PIB Not Contained



KlymetControl® Plus

Acrylic Adhesive, PIB Contained



KlymetControl® Plus Superior Insulated Glass Solutions

KlymetControl® Plus – taking away the vulnerable edge

80% of the energy lost through a window occurs at the edge of the glass. It's at the edge of the glass where the glass or IGU is most vulnerable to heat loss, cooling loss and condensation during cooler months.

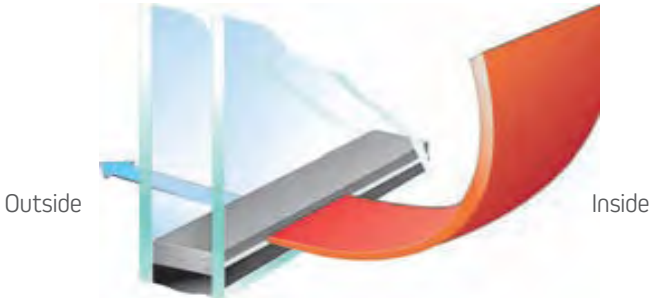
Considered to be a conductive energy waster, metal spacers provide a direct path for heat loss, minimising heat flow resistance and reducing the performance of even the highest performing glass products.

The fact that the OptEseal™ spacer has no metal means that the ability of KlymetControl® Plus to conduct heat away from the inside to the outside is considerably reduced, effectively blocking the heat escape path and improving the thermal insulation of the installed window system.

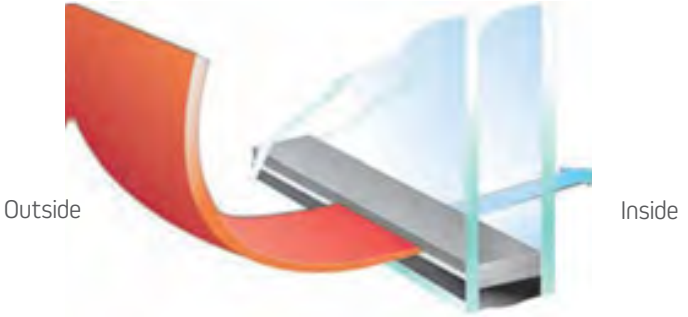
Similarly, the OptEseal™ spacer reduces heat transfer from the outside to the inside through the spacer on warm or hot days, reducing the overall solar heat gain into the building.

By effectively blocking the heat path, on warm days the OptEseal™ spacer also enables the cooler air on the inside of the building to stay inside, enabling KlymetControl® Plus IGU to assist in providing a better controlled internal environment all the year round.

Prevents heat loss on a cold day



Reduces heat gain on a warm day

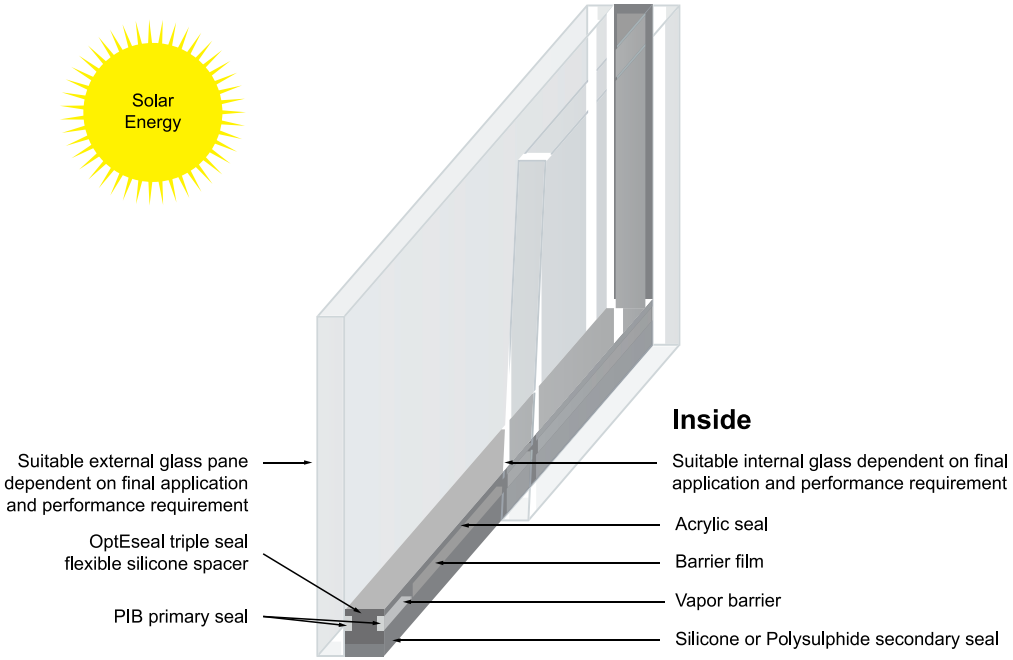


KlymetControl® Plus Superior Insulated Glass Solutions

KlymetControl® Plus – sustainable and durable

During the manufacturing process, most IGU's have a polyisobutylene (PIB) sealant applied first to the aluminium spacer which acts as the moisture barrier on the inside of the IGU. The secondary seal of Silicone or Polysulphide is then applied to act as the main structural sealant, holding the IGU together.

KlymetControl® Plus however incorporates a pre applied structural seal located on the inside of the OptEseal™ spacer which takes the form of a pressure sensitive acrylic adhesive which in turns forms an incredibly strong bond between the glass and the OptEseal™ spacer. The secondary seal of either silicone or polysulphide then forms the gas/moisture seal on the outside of the IGU where it will have the most benefit. The result is a very durable, automatically applied multi edge seal IGU which provides consistency in performance, unit after unit.



Extensively tested and used Worldwide

The silicone based thermoset technology supporting the manufacture and use of the OptEseal™ warm edge spacer in KlymetControl® Plus ensures an IGU which not only provides structural integrity with flexibility, but also ensures proven durability with UV stability.

Supporting its long term project history in some of the World's most demanding climates, OptEseal™ has been extensively tested Worldwide to Internationally recognised standards including:

North America

- ASTM E2188/E2190 (HIGS) Weather Cycle Test, where the durability of the OptEseal™ spacer has been consistently proven by passing multiple rounds of accelerated aging in cycling conditions from + 60^{0}C to -29^{0}C, with 100% UV and 95% RH
- ASTM E2189
- Dade County Hurricane Test
- Structural testing to ASTM E330-02 up to 155psf (7425 Pa)Europe
- EN1279
- DIN 1286 Teil 1&2
- BSI 5713

With sustainability, durability, thermal efficiency and structural integrity working closely together to underpin future facade glazing programs, KlymetControl® Plus sets the new standard for even the most demanding commercial glazing installations.

An MHG Company

KlymetShield™

Low Emissivity Glass

solos glass

see the possibilities

KlymetShield™ Low Emissivity Glass

What is KlymetShield™?

Ideally suited to Australian climatic conditions, KlymetShield™ is a cost effective and readily available range of hard coated, Low Emmissivity, energy efficient glass.

KlymetShield™ is available in a range of clear, neutral, green and grey tones to match the levels of solar control and natural daylight required to complement the thermal insulation performance of the Low E glass coating.

Available as a coated float glass in 4mm, 5mm, 6mm and 10mm* thicknesses as standard, KlymetShield™ is suitable to be single glazed in most domestic and commercial window suites. Available in standard annealed form, KlymetShield™ is also available laminated, toughened and heat soaked to meet the Grade A safety and regulatory requirements of AS/NZ1288 and as such is suitable for a wide range of window and door applications.

KlymetShield™ is equally suitable for facilitating BASIX compliance in NSW as a single glazed product in all its forms, or being used as one pane of a KlymetControl® double glazed unit (IGU) to further improve the overall energy efficiency properties of both the glass itself and the overall window system.

Single Glazed KlymetShield™

As a single glazed annealed, toughened or laminated product, KlymetShield™ is suitable for both commercial and residential window and door applications, providing improved energy efficiency in both Summer and Winter without compromising on acceptable levels of freely available natural light.

*Available in KlymetShield™ Clear only

4mm KlymetShield™ Clear

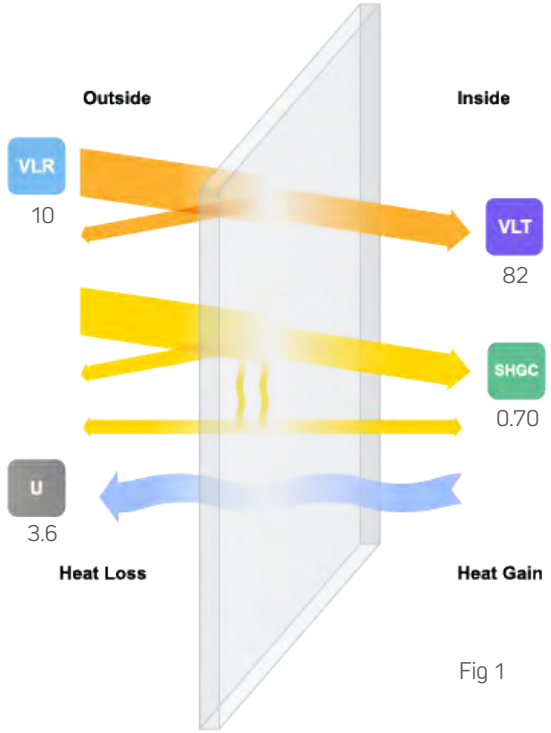


Fig 1

6.38mm KlymetShield™ Laminated Neutral

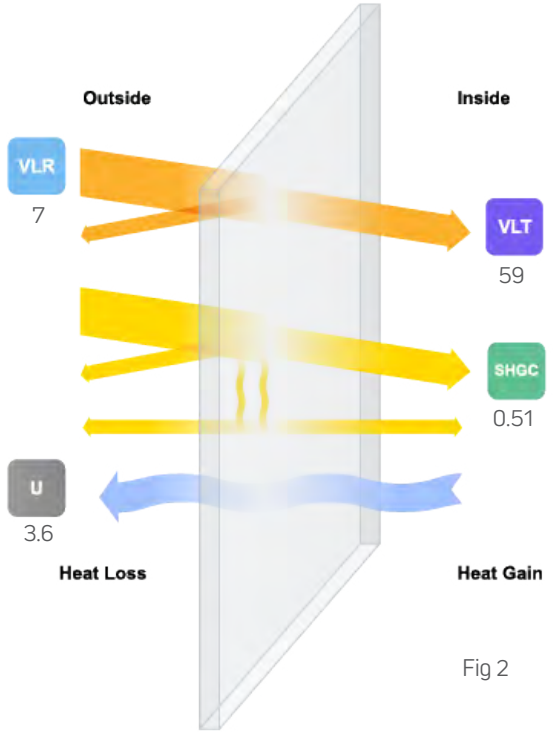


Fig 2

KlymetShield™ Low Emissivity Glass

Single glazed Annealed and Toughened KlymetShield™

Whether specified in Commercial or Residential applications, for single glazed annealed and toughened KlymetShield™ the coating is always glazed to the inside of the building on surface 2.

Single glazed KlymetShield™ provides an excellent balance of both light transmission, thermal insulation (U value) and reduced solar heat gain (SHGC) when compared to both standard EnviroClear™ and EnviroTone™ products across the complete range.

KlymetShield™ single glazed performance data

Glass Product	Normal Thickness	Visible Light		Solar Energy		UV Trans.	U-value W/m2-C	SHGC	Shading Co.
		Trans.	Refl. Out	Trans.	Refl.				
KlymetShield™ Neutral (#2)	4	61	7	48	8	48	3.7	0.55	0.64
	6	60	7	46	7	46	3.7	0.54	0.62
KlymetShield™ Clear (#2)	4	82	10	66	10	49	3.7	0.70	0.81
	5	82	11	67	11	52	3.7	0.70	0.81
	6	82	10	66	10	49	3.7	0.70	0.81
	10	79	11	60	9	43	3.6	0.65	0.76
KlymetShield™ Grey (#2)	4	50	7	45	7	21	3.7	0.53	0.62
	6	40	6	37	7	16	3.7	0.47	0.55
KlymetShield™ Green (#2)	4	75	10	49	8	30	3.7	0.56	0.65
	6	71	9	39	7	23	3.7	0.49	0.57

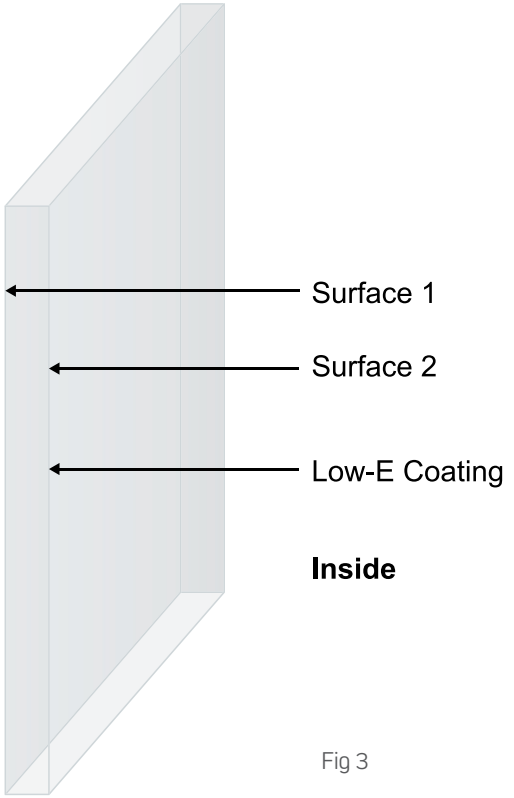


Fig 3

KlymetShield™ Low Emissivity Glass

KlymetShield™ Laminated

Available in 6.38mm, 8.38mm, 10.38mm and 12.38mm thicknesses as standard, KlymetShield™ Laminated is also available as a special custom laminated glass of various thicknesses to create a range of different energy efficient glass solutions for safety, security and decorative purposes.

When used in either Residential or Commercial applications, it is important that KlymetShield™ is glazed with the coating to the inside of the building on surface 4.

Offered in a range of toned options to provide different light transmissions and levels of solar heat gain (SHGC), KlymetShield™ Laminated offers improved levels of heat insulation over both clear and toned single glazed glass whilst providing excellent levels of solar control, low reflection and protection to furnishings from harmful UV rays. Because the product is laminated, it also provides Grade A safety to AS/NZ 1288 and is easily stocked, cut and processed.

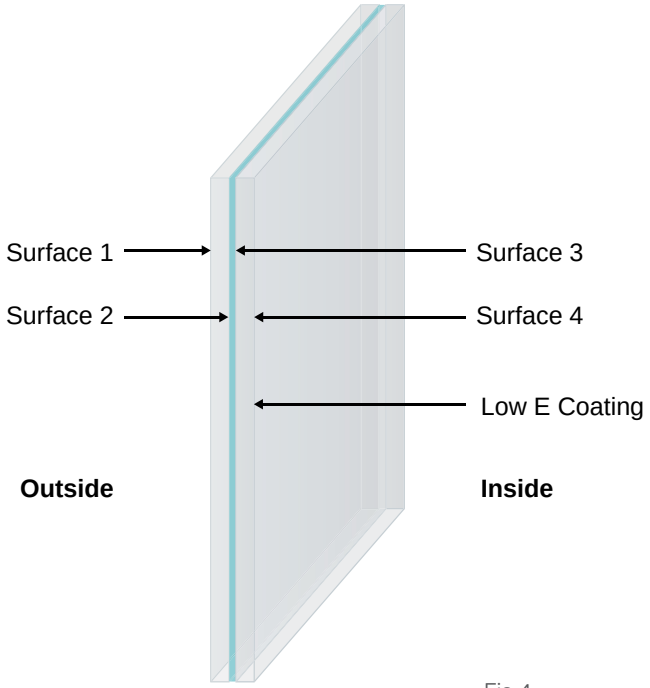


Fig 4

With a series of benefits including enhanced energy efficiency and solar control, Grade A safety and reduced UV transmission limiting fading of furnishings, KlymetShield™ Laminated continues to be the perfect mid range retrofit glass in residential applications for those wishing to upgrade from 3mm or 4mm clear glass in their windows without necessarily having the need to change their window frames.

With the increasing focus on the need to improve overall levels of energy efficiency in both Commercial and Residential buildings, whilst providing a range of additional benefits inherent to the product as shown in Figures 4 and 5, KlymetShield™ Laminated has increasingly been specified as part of a KlymetControl® IGU with the coating located on either surface 2 or 3 as shown in Figs 5 and 6.

KlymetShield™ Laminated performance data

Glass Product	Normal Thickness	Visible Light		Solar Energy		UV	U-value	SHGC	Shading
		Trans.	Refl. Out	Trans.	Refl.	Trans.	W/m2-C		Co.
KlymetShield™ L Clear (#4)	6.38	82	10	64	9	<1	3.6	0.68	0.79
	10.38	79	11	58	9	<1	3.6	0.64	0.74
KlymetShield™ L Neutral (#4)	6.38	59	7	42	7	<1	3.6	0.51	0.60
	10.38	62	8	40	7	<1	3.6	0.49	0.58
KlymetShield™ L Grey (#4)	8.38	37	6	27	6	<1	3.6	0.39	0.46
	10.38	38	6	26	6	<1	3.6	0.39	0.46

KlymetShield™ Low Emissivity Glass

KlymetControl® IGU incorporating KlymetShield™ Low E glass

Glazed with the Low E coating on on either surface 2 or surface 3, KlymetShield™ provides a significant performance enhancement across a wide range of KlymetControl® IGU's. When glazed with the coating on surface 3, usually in its clear form, the main objective is to improve the thermal insulation or U Value performance of the IGU.

When glazed on surface 2, usually in its neutral or toned form, the main objective is to help reduce the solar heat gain (SHGC) into a building and hence reduce the heat load and improve occupier comfort. This can be achieved with either no or minimal impact on the thermal insulation (U Value) performance.

KlymetControl® IGU with KlymetShield™ Laminated Low E coating on surface 3

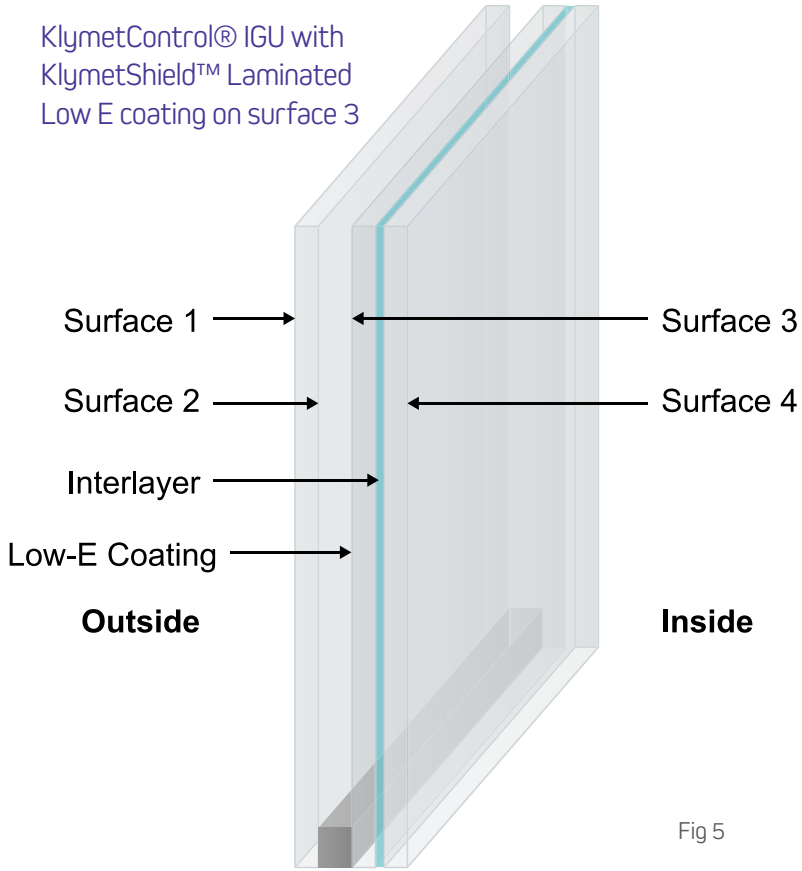


Fig 5

KlymetControl® IGU with KlymetShield™ Low E coating on surface 2

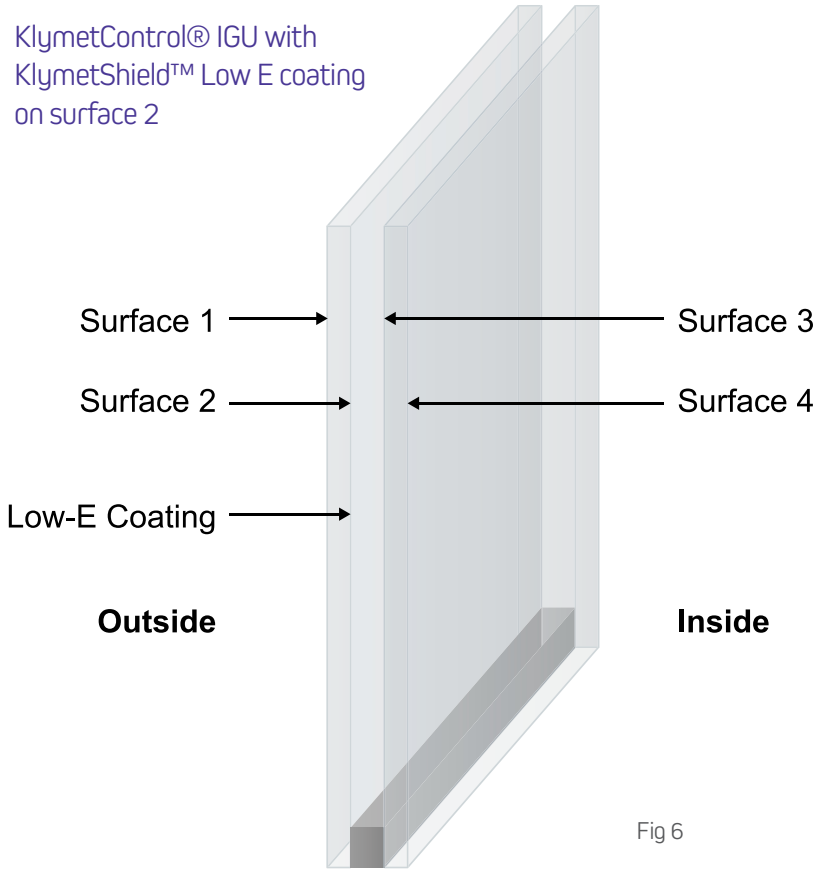


Fig 6

KlymetShield™ Low Emissivity Glass

KlymetControl® Double Glazing - incorporating KlymetShield™ Clear Low E backing glass (#3)

Float Glass	Normal Thickness	Visible Light Trans.	Visible Light Refl. Out	Solar Energy Trans.	Solar Energy Refl.	UV Trans.	U-value W/m2-c 12mm Air	U-value W/m2-c 12mm Argon	SHGC	Shading Co.
EnviroClear™	4+12+4	74	17	56	15	42	.9	1.6	0.69	0.78
	5+12+5	72	17	53	14	39	1.9	1.6	0.66	0.76
	6+12+6	73	16	52	14	36	1.9	1.6	0.66	0.76
EnviroTone™ Grey	4+12+4	45	9	38	10	23	1.9	1.6	0.51	0.59
	5+12+5	40	8	34	9	21	1.9	1.6	0.48	0.54
	6+12+6	35	7	30	8	16	1.9	1.6	0.43	0.49

Fig 7.
4mm EnviroClear™ with 4mm KlymetShield™ Clear Low E (#3)

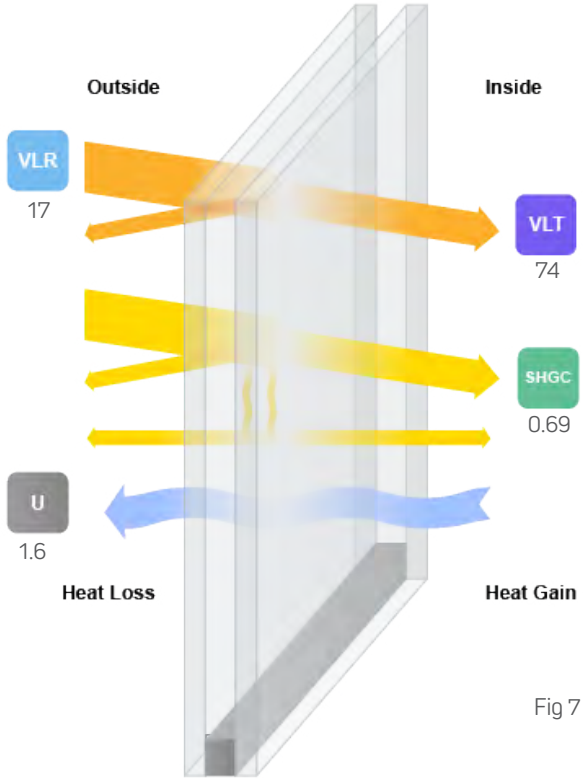


Fig 7

Fig 8.
4mm EnviroTone™ Grey with 4mm KlymetShield™ Clear Low E (#3)

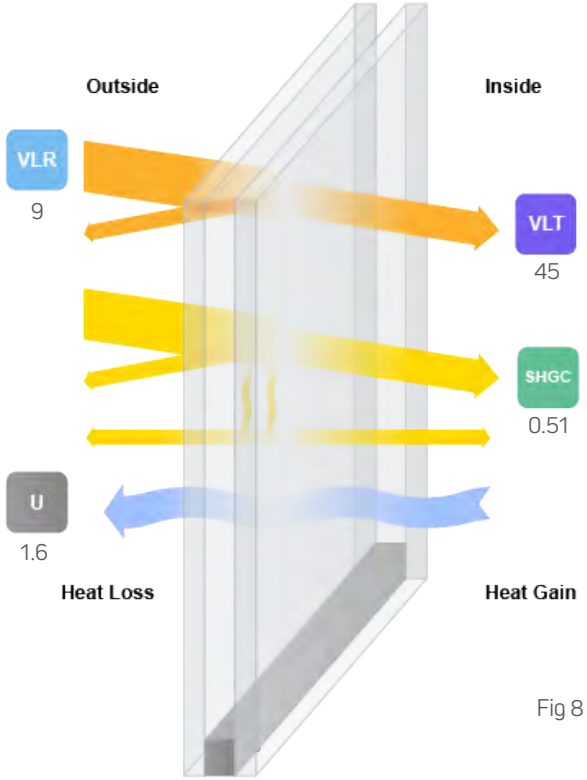


Fig 8

KlymetShield™ Low Emissivity Glass

KlymetControl® IGU incorporating KlymetShield™ Neutral and KlymetShield™ Grey (#2) both with an EnviroClear™ backing glass

Glass Product	Normal Thickness	Visible Light Trans.	Visible Light Refl. Out	Solar Energy Trans.	Solar Energy Refl.	UV Trans.	U-value 12mm air	U-value 12mm Argon	SHGC	Shading Co.
KlymetShield™ Neutral #2	4+12+4	55	12	38	10	34	1.9	1.6	0.46	0.53
	6+12+6	56	12	36	10	30	1.9	1.6	0.45	0.52
KlymetShield™ Grey #2	4+12+4	45	9	38	9	18	1.9	1.6	0.46	0.53
	6+12+6	35	8	29	8	13	1.9	1.7	0.39	0.45

Further performance data is available in the **Resource Centre**

Fig 9.
4mm KlymetShield™ Neutral (#2) with 4mm EnviroClear™

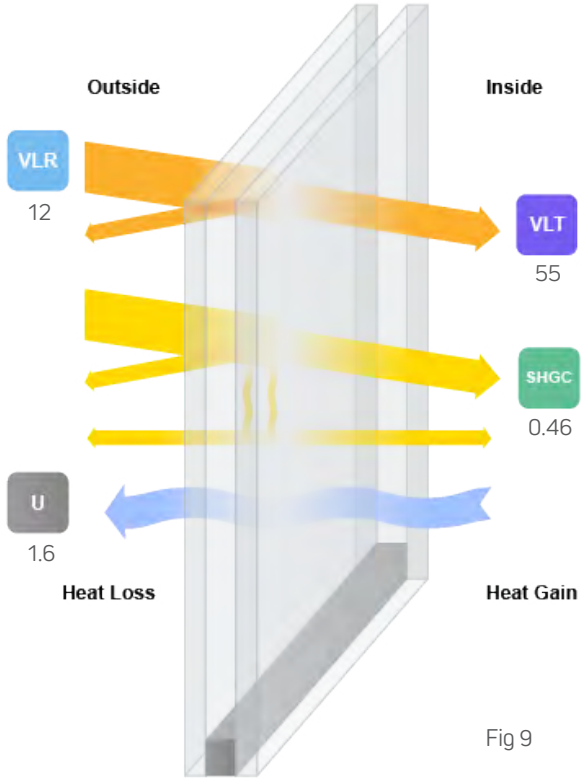


Fig 9

Fig 10.
4mm KlymetShield™ Grey (#2) with 4mm EnviroClear™

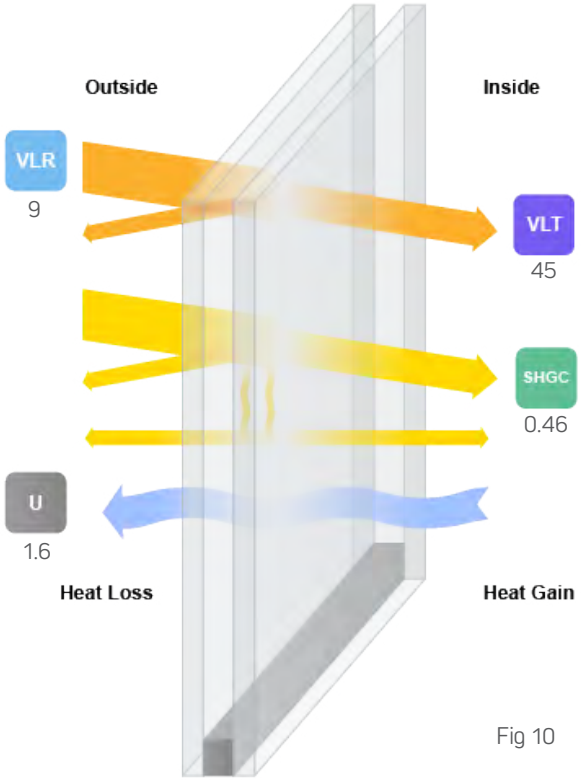


Fig 10

KlymetShield™ Low Emissivity Glass

KlymetShield™ - some points to consider

Helping to provide cost effective energy management

With its specialist Low E coating, KlymetShield™ is able to assist in the reduction of solar heat gain in Spring and Summer and the reduction of heat loss during Autumn and Winter as both a single glazed product and as part of a KlymetControl® IGU. KlymetShield™ helps to improve the overall solar control and thermal insulation performance of both commercial and residential window suites and reduces the reliance on artificial temperature control to either provide cool air in summer or warm air in Winter.

KlymetShield™ Low Emissivity Glass

Prevention of condensation

When single glazed, KlymetShield™ is not designed to prevent surface condensation forming on the glass, especially in colder climates during Winter.

To help reduce the level of any condensation, the use of KlymetShield™ as a component within an argon filled KlymetControl® IGU glazed in a suitable high performance glazing system is recommended here as the heat exchange across the gap between the inside and the outside of the building is reduced and the temperature of the inner glass surface is increased. Alternatively, the improved energy efficient performance of our range of OptEma™ Plus IGU's is an ideal solution.

Durability of the Coating

Because the coating on the surface of the glass is applied during the actual manufacturing process of the glass, the coating actually becomes a permanent part of the glass itself. As such, KlymetShield™ is a highly durable product, easily cleaned and suitable for both fixed and opening windows as well as doors and rooflights.

It is this durable pyrolitic coating technology which enables the coating to be exposed to the inside of the building when glazed as a single glazed product, enabling improved overall energy efficiency performance in a comparatively thin, light, yet easily maintained product.

Benefits

- Can be installed as either single glazed or double glazed
- As single glazed, suitable for most single glazed window frames for both new build and replacement/retrofit in either annealed, toughened or laminated form.
- Can be incorporated into a KlymetControl® IGU for even further enhanced energy efficiency and is suitable for most contemporary aluminium, timber or UPVC double glazed window suites.
- Highly durable pyrolitic Low E coating suitable for single glazing.
- Range of light and solar heat gain transmissions in combination with the Low E coating ensures that KlymetShield™ is suitable for all climatic conditions.
- Can be toughened and laminated to meet the requirements of AS/NZS 1288 to ensure suitability for all relevant applications.
- Cost effective and readily available energy efficient solution

Applications

- Windows, doors, atria, rooflights, skylights
- Renovations
- Retrofit glazing

Solar Control with Low E Glass

Whilst most types of uncoated glass have very similar and quite high U values, glass types which have a Low E coating applied to them have a much lower U value and are therefore much more energy efficient.

However the Low E coating does not just improve the level of insulation of the glazing by reducing the amount of heat lost to the outside, it also assists in reducing the amount of heat transferred from the outside to the inside of the building through the glazing.

The overall energy efficiency of the glass is also determined by the type of glass onto which the coating is applied (for example, clear float or toned), or whether the glass is single glazed, double glazed or double glazed with an inert gas, such as argon, in the airspace.

How does Low E work to reduce heat gain into a building

Glass absorbs both light and heat energy which is transmitted directly from the sun in the form of short wave infra red heat energy. That energy is subsequently either re-radiated away from the glass surface as long wave energy or moved away from the surface through convection.

Low E coatings do allow some direct transmission of short wave infrared radiation, allowing a proportion of the directly transmitted energy from the sun to be transmitted straight through the glass.

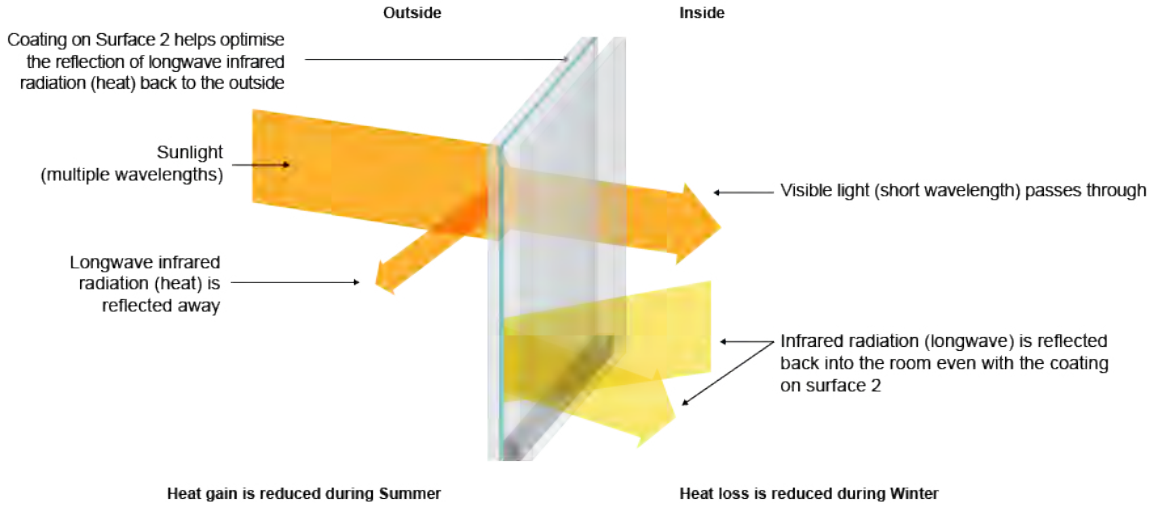
The low E coating blocks a % of the short wave radiation, absorbs it within the glass and re-radiates it outside, reducing the amount of heat being transferred to the inside of the building.

Additionally, because short wave radiation changes to long wave radiation when it hits the ground, cars, buildings etc, the coating on the glass helps further reduce the heat gain into a building by reflecting this long wave radiation back outside.

Whilst using a single glazed hard coated Low E glass, such as KlymetShield™ and having the coating facing the inside of the room will help to both reduce heat gain and heat loss, the most effective barrier to heat gain is to have Low E coating on surface 2 of an IGU.

Whilst an air gap in an IGU slows down the heat transfer through the IGU itself, placing the Low E coating on surface 2 reflects the heat from the sun before it gets to the air gap as well as slowing down the heat transfer even further.

In hot climates or to reduce the heat gain into buildings in Summer. this process is improved by having a solar control glass with a Low E coating applied to it as the outer pane of an IGU limiting the amount of heat transfer through to the Low E coating even further.



KlymetControl® IGU
With Low E Glass Coating on Surface 2

Solar Control with Low E Glass

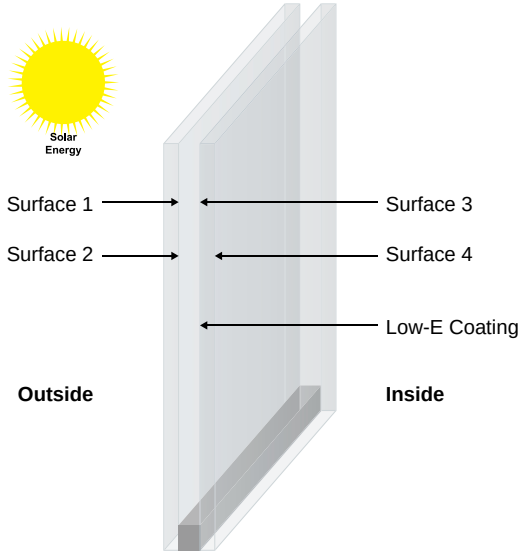
How does Low E work to reduce heat loss from a building?

The Low-E coating has the ability to filter out certain types of energy and as such is a more effective barrier to some wave lengths of light but not others. Low E coatings are particularly effective in reflecting Long Wave infared heat energy.

Long wave infrared is the heat produced by our bodies, heaters and the furnishings in a warm room and it is the transmission through the glass of long wave infrared which is significantly reduced by the low-e coating.

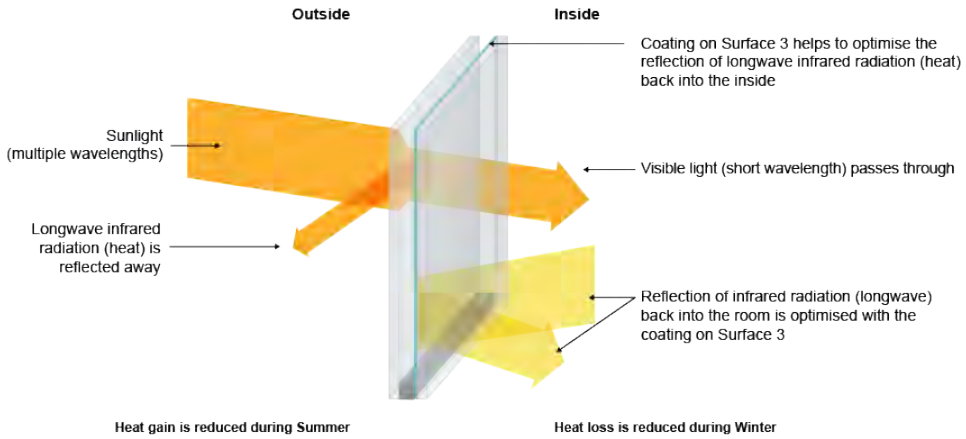
The Low E coating on the glass therefore reflects energy back into the room or office space, reducing the amount of heat escaping through the glass.

The most effective barrier to heat loss is to have the Low E coating on surface 3 of an IGU.

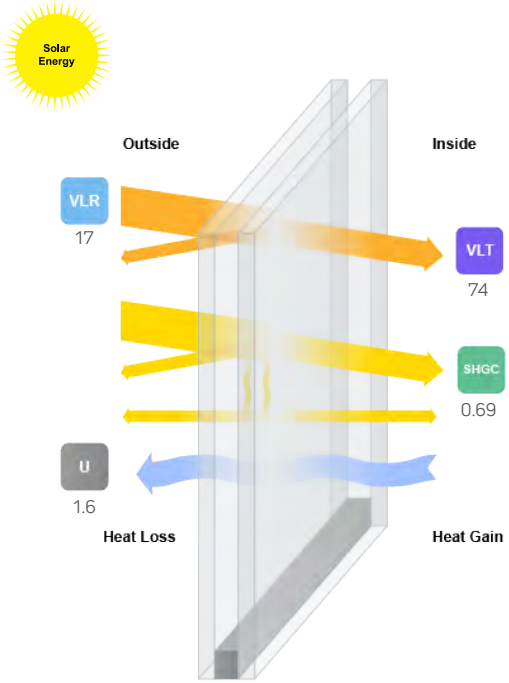


This improves the insulation, keeps the inside surface of the glass warmer therefore keeping the room itself warmer reducing the amount of heat required to be generated by central heating systems, gas, electric or wood burn heaters. In cold climates it also helps minimise any chance of condensation forming on the inside surface of the glass.

KlymetControl® IGU with Low E Glass Coating on Surface 3



KlymetControl® IGU with 4mm EnviroClear™ /12mm argon / 4mm KlymetShield™ Low E (#3)



Solar Control with Low E Glass

Low E coatings with additional solar control

Recent improvements in CVD technology however also allows for a limited number of additional solar control interlayers to be applied through the same manufacturing process to further improve the overall performance of the Low E coated glass.

The result has been the development of solar control coated glass products with low emissivity (Low E) characteristics which provide both moderate to high levels of solar control, excellent daylight transmission, lower levels of internal and external reflectivity and high levels of thermal insulation.

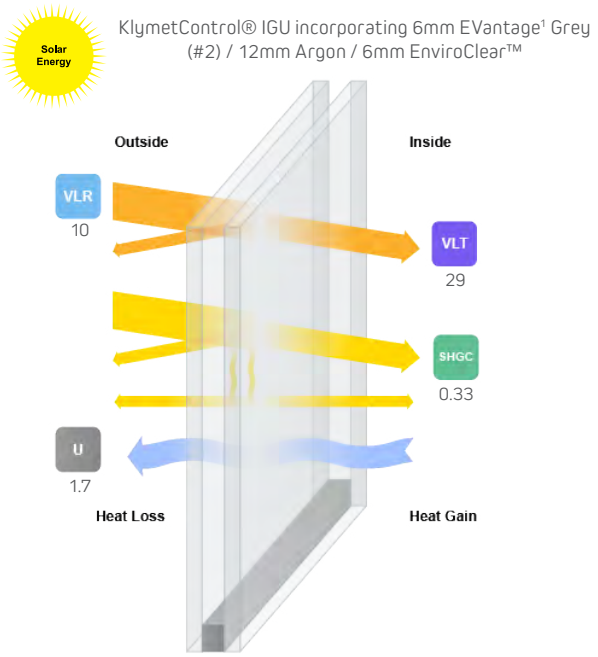
Each solution provides different performance parameters with regards to the balance across SHGC, light transmission and thermal insulation. As such, with such a broad range of solutions on offer, the designer or specifier has a number of choices when choosing a buildings appearance as well as its performance characteristics.

In addition to KlymetShield™, the SOLOS Glass range includes a number of the World's leading Low E brands including EVantage*, SolTech* and Sunergy*. Because of the extremely durable nature of the pyrolitic coating, each can be single glazed or incorporated into a KlymetControl® IGU for enhanced performance.

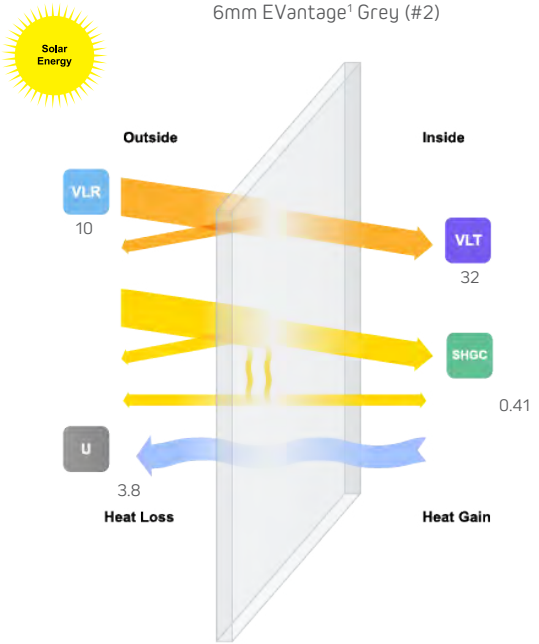
*EVantage and SolTech are registered trademarks of Viridian.

Sunergy is a registered trademark of AGC Flat Glass Asia Pacific Pty Ltd

KlymetControl® IGU incorporating 6mm EVantage[1] Grey (#2) / 12mm Argon / 6mm EnviroClear™



6mm EVantage[1] Grey (#2)

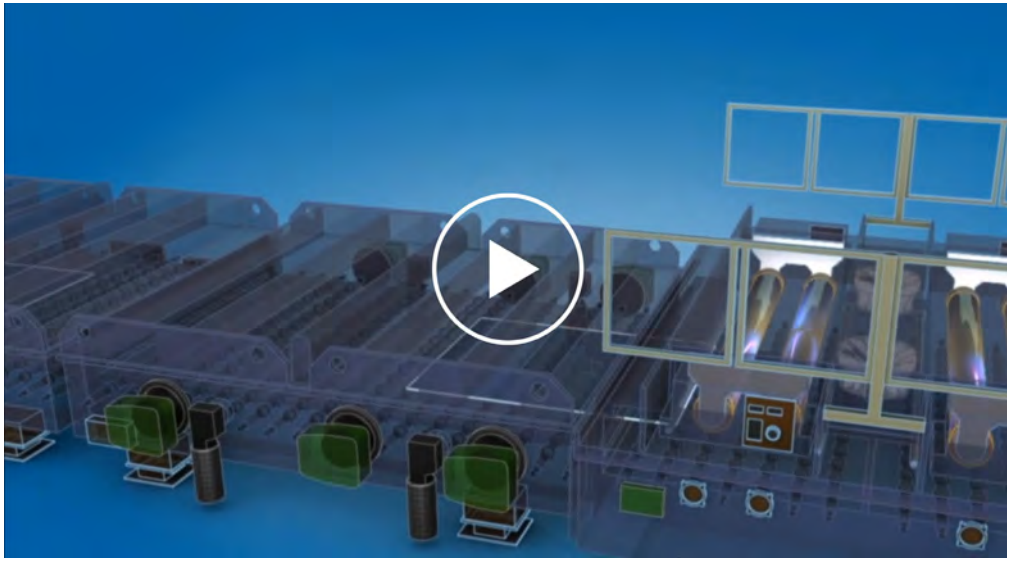


Solar Control with Low E Glass

The manufacture of Sputtered Soft coated glass

Whereas the pyrolitic method of hard coat coated glass manufacture can manufacture both reflective solar control coatings and less reflective Low Emissivity type glasses, Sputtered soft coating technology focuses on multi layered, high performing, thin film Low E coatings.

Unlike pyrolitic or hard coated glass which has the coating applied whilst the glass is being manufactured, soft coated glass is manufactured by applying multiple thin layers of silver and metal oxides to the glass surface by a sputtering deposition process undertaken after the glass has been manufactured. Each process creates different types of coatings with different properties and different levels of overall performance.



Whilst multiple layers of metallic oxides can be applied, the overall thickness of sputtered coatings are only about 1/10,000th of the thickness of a human hair.

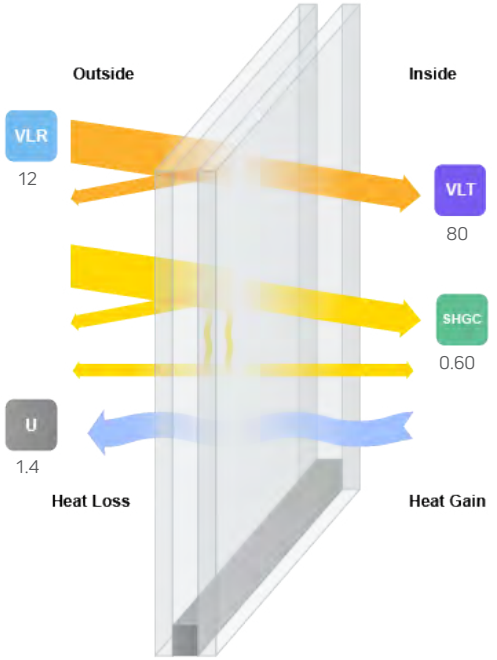
Often known as 'offline' coatings, sputtered coatings help create a finished glass product that is much more dynamic in performance than one utilising a pyrolitic, or hard, coating.

The benefits of sputtered Low E glass

Sputtered coatings have enabled an improved balance between SHGC and U value performance to be achieved when compared to clear and pyrolitically coated products, whilst also retaining high levels of light transmission.

Because of the 'soft' nature of Sputtered coatings, sputter coated Low E glass products require special handling and glass processing techniques and can only be glazed as part of an IGU. The coating faces the airspace on either surface 2 or 3, depending on whether the focus is on preventing heat gain or heat loss, which protects the coating from environmental conditions and also maximises the overall performance of the IGU. OptEma™ and CoolRay™ are examples of IGU's manufactured with a sputtered Low E glass.

OptEma™ IGU incorporating 4mm EnviroClear™ / 12mm argon / 4mm OptEma™ (#3)



Insulated Glass Units (IGUs)

What is an Insulated Glass Unit?

In its standard, uncoated form, glass is an excellent conductor, but a poor insulator. Indeed clear float glass can often increase the effects of extreme temperatures; rapidly overheating a room in the summer and allowing warm air to easily and quickly transfer through the glass from the inside of the room to the colder outside in winter.

It was in the late 1800's that it was discovered that two pieces of sealed glass with an air pocket in-between provided enhanced thermal insulation and helped to reduce the effect that both sunlight and exterior temperature had on the internal conditions of a building. This is because air is a poor conductor of heat, so having an air gap between the panes of glass in an IGU slows down the transfer of heat. Incorporating argon gas in the air space further reduces the heat transfer as does incorporating Low E coatings on the inside surface of the glass. However, it has only been relatively recently that IGU's (also known as Double Glazed Units) have become used more frequently in Australia both in commercial and residential applications.

Whilst the quality of the components have improved and manufacturing techniques have become increasingly automated, the basic premise of IGU's offering suitable levels of light for the occupants of the building whilst helping to provide better solar control and provide improved overall thermal insulation for the buildings envelope remains in place today.

An IGU consists of two (or three for a triple glazed unit) pieces of glass separated by a spacer and an air space. The air space is often filled with argon to help improve the overall thermal efficiency of the IGU because argon is a much better insulator than just air. SOLOS Glass fill all its IGU's with argon as standard. This is particularly valuable for residential applications where the emphasis is increasingly on minimising heat exchange through the window in all climatic conditions as well as improving overall thermal insulation in colder climates.

Traditionally using clear glass, improvements in the overall performance of the panes of glass used to manufacture an IGU, especially recently through the use of specialised coating technology, has meant a broad range of aesthetic and energy efficient performance options are now available for both commercial and residential applications.

Further the incorporation of specialised glass types within a KlymetControl®, OptEma™ or OptEma™ Plus IGU has seen the range of standard applications extended into the areas of safety, security, acoustic, decorative and other purposes to meet specific performance criteria in addition to just improved energy efficiency.

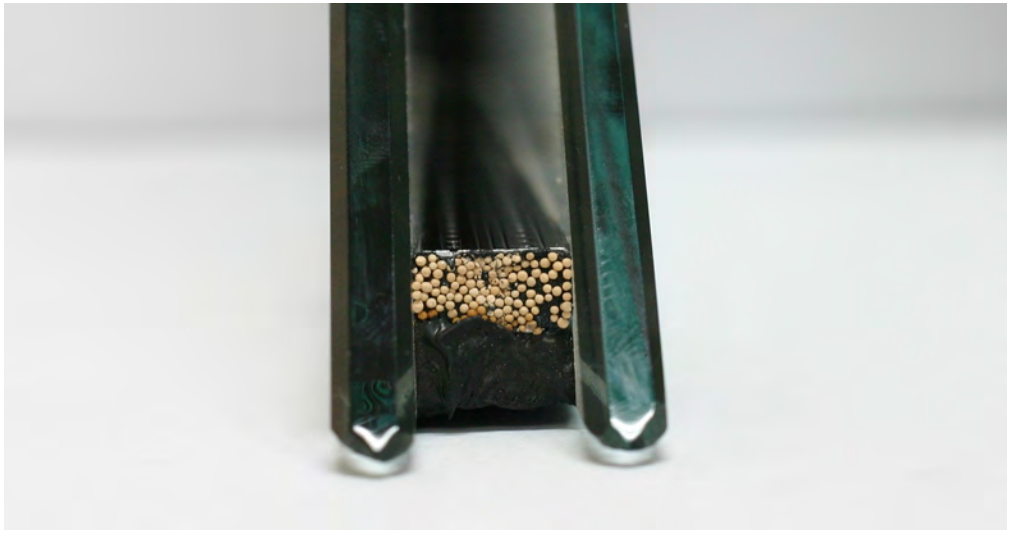
Manufacturing the IGU's

Initially the required panes of glass are cut and washed before being brought to the front of the IGU manufacturing line. For each IGU manufactured, one of two spacer types can be used; either an aluminium spacer or an OptEseal™ silicone warm edge spacer, each type of spacer having a range of different widths up to a maximum width of 20mm.

Aluminium Spacer

The spacer is cut to size and then bent at either three or four corners before the two ends of the bar are joined together with either a corner key (3 bent corners) or a straight connector (4 bent corners). The completed aluminium spacer has 2 of the 4 sides filled with dessicant which acts as a drying agent to absorb any moisture within the space which may have found its way into the IGU during manufacture or which may find its way into the IGU during its lifetime.

The finished spacer then has a primary seal made from polyisobutylene (PIB) applied to its perimeter along all four edges on both sides. The spacer is then applied to one piece of glass which has been automatically moved into position on the IGU manufacturing line.



Insulated Glass Units (IGUs)

The glass is then moved along the line into what's known as the 'Press'

The second piece of glass is then automatically moved into position in the Press and subsequently bonded to the PIB on the other side of the spacer.

Here the space between the two panes of glass is filled under vacuum with argon, an inert gas, which helps improve the overall energy efficiency of the unit itself.

The unit is then automatically moved along the IGU manufacturing line where a robot automatically fills the void between the spacer and the edge of the glass with a secondary seal made from either polysulphide or Silicone depending on the final application of the unit.

A polysulphide secondary seal is suitable for the vast majority of applications. However, due to its increased strength, bond and enhanced resistance to UV, heat, humidity and moisture penetration, a silicone secondary seal should be used for roof glazing applications, stepped units or where the secondary seal is exposed. Silicone sealed IGU's are the only type of IGU which should be considered for structural glazing applications.

Together, the primary and secondary seals are there to ensure that no air enters or leaves the unit and prevents any vapour from entering.

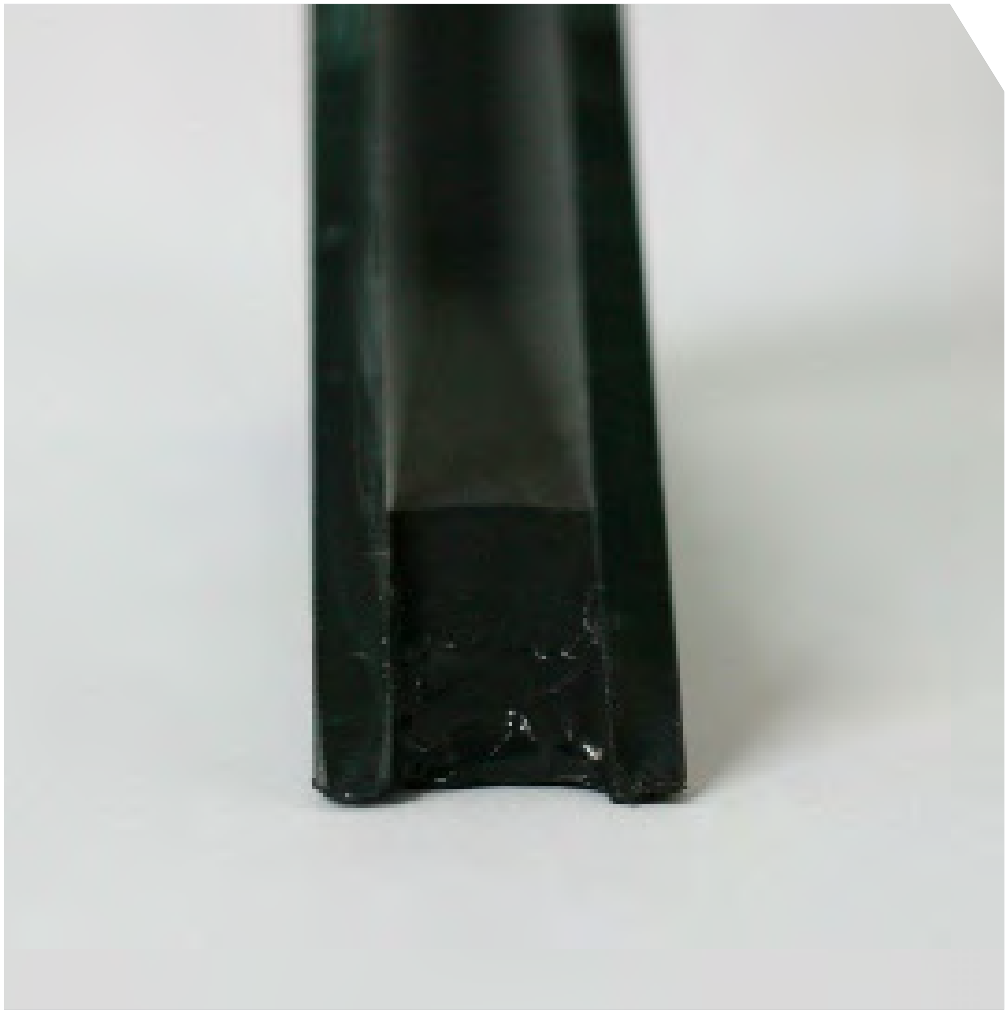
OptEseal™ Spacer

The manufacturing process is similar to that of an IGU incorporating an aluminium spacer with the exception being that in lieu of the aluminium spacer, the OptEseal™ spacer is robotically applied to the glass with the adhesion to the glass being ensured by a unique triple seal design which incorporates an inner acrylic adhesive seal, a polyisobutylene primary seal and an outer silicone seal all working together for enhanced structural strength and durability. The glass then moves through the press and into automatic secondary seal application in a similar manner to an IGU manufactured with an aluminium spacer.

Shaped IGU's

Available as part of the KlymetControl® range, shaped IGU's can be manufactured using OptEseal™, or, for simpler straight edge shapes, the standard black aluminium spacer bar.

The OptEseal™ spacer provides its own primary seal with the IGU, with either the polysulphide or silicone secondary seal applied during manufacture.



OptEseal™ Spacer

Insulated Glass Units (IGUs)

OptEseal™ - warm edge silicone IGU spacer

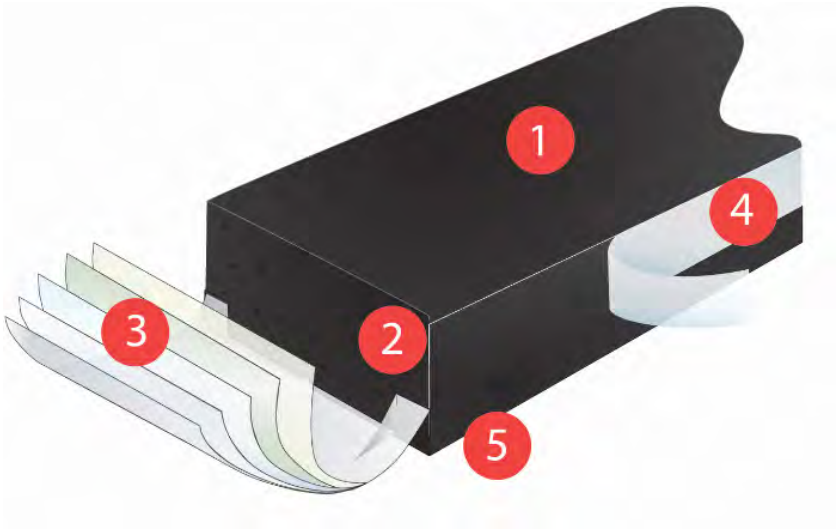
With up to 80% of a windows energy loss occuring at its edge, OptEseal™ is a specialist warm edge spacer designed to bridge the thermal gap between the glass and the edge of the frame. As such the edge of the glass pane becomes warmer in colder conditions providing additional protection from any condensation and an improved barrier to heat transfer. This is becoming increasingly important as higher performing UPVC, timber and thermally broken aluminium window suites become increasingly available for the residential market, improving the overall energy efficiency of the window, not just the glass.

Further, as pressure for improved structural strength and durability becomes at least as important as thermal performance in commercial glazings, the benefits associated with OptEseal™ in commercial IGU's become increasingly apparent.

	Aluminium Spacer	OptEseal™
Glass Surface Temperature	Poor	Excellent
Thermal Performance	Poor	Excellent
Condensation Resistance	Poor	Excellent
Edge Seal Integrity	Good	Excellent
Structural Strength	Excellent	Excellent
Dew Point Drop	Good	Excellent
Sound Absorption	Good	Excellent
Sealant Stress Reduction	Good	Excellent
UV Resistance	Excellent	Excellent
Desiccant Capacity	Excellent	Excellent
Wind Loading	Very Good	Excellent
Structural Glazing	Yes	Yes
Compatible with Performance Coatings	Yes	Yes

That's why we've incorporated OptEseal™ not only in our residentially aligned range of OptEma™ Plus IGU's, but also in our commercially aligned range of KlymetControl® Plus IGU's.

OptEseal™ Cross Section



1. Smooth, matt finish guaranteed against blistering and bubbling.
2. Thermoset silicone matrix
3. Proprietary multi-layer vapour barrier
4. Acrylic structural adhesive.
5. Captive PIB primary seal for triple unit seal longevity.

Insulated Glass Units (IGUs)

OptEseal™ - warm edge silicone IGU spacer

Improving Energy Efficiency And Comfort All Year Round

Windows and doors fitted with OptEseal™ warm edge spacer will help keep your home warmer in Winter and cooler in Summer. Unlike the aluminium spacer used in many double glazed units, OptEseal™ conducts less heat at the edge of the glass where most energy flow occurs, actively blocking the heat path and allowing your windows and doors to better manage the level of comfort in your home all year round.

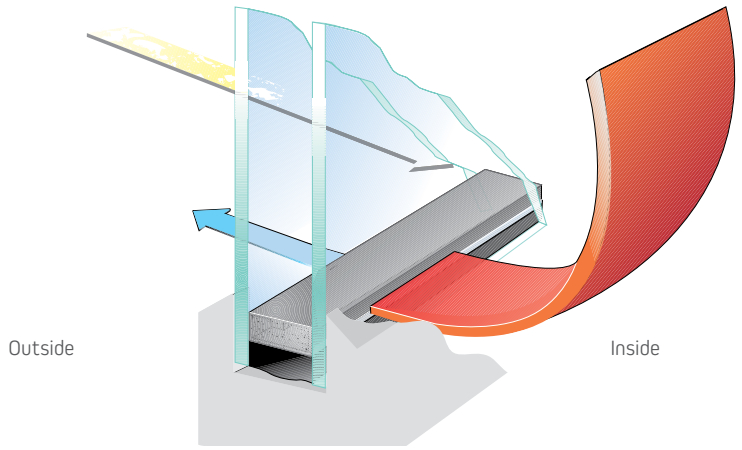
The Best Place In The World

Home is important. So is saving energy, keeping your energy bills down and enjoying a comfortable living environment.Choosing windows and doors which are glazed with double glazed units (IGU) incorporating an OptEseal™ warm edge spacer is an important step in achieving this. It's time to relax and look forward to a more energy efficient future.

Insulated Glass Units (IGUs)

OptEseal™ - warm edge silicone IGU spacer

Window energy ratings are the easiest way to determine the overall energy performance of windows. In Australia, the Window Energy Rating Scheme (WERS) rates and evaluates the overall energy performance of windows and doors to assist specifiers and consumers in making better informed decisions. Rating the cooling and heating performance of a window or door on a scale of 1-10 stars, the WERS ratings take into account the heat losses through the glazing and framing material (U value), the energy losses arising from air leakage through the seals (Air Inf) and the solar heat gained from the sun (SHGC), as well as the level of light transmittance (Tvw). The more stars, the better the performance of the window or door. Choosing a window or door glazed with an OptEma™ Plus IGU incorporating an OptEseal™ spacer means you are choosing one of the highest performing energy efficient glazing systems available.



Enjoy The Peace And Quiet...

Want to unwind? It's easy - if you chose windows fitted with OptEseal™. They've been proven to reduce noise transmission by over 1 decibel when compared to IGUs manufactured with a comparable glass make-up using a standard aluminium spacer.

Insulated Glass Units (IGUs)

OptEseal™ - warm edge silicone IGU spacer

A Happy, Healthy Home

We all want to make our homes as safe as possible. And that includes keeping allergens at bay. The mould caused by condensation on conventional windows can aggravate respiratory conditions like asthma. OptEseal™ helps reduce condensation by up to 70% - virtually eliminating mould growth and the bacteria it can lead to.

OptEseal™ - The benefits

Where OptEseal™ is the preferred choice of spacer, it provides a unique triple seal design which incorporates an inner acrylic adhesive seal, a polyisobutylene primary seal for enhanced gas retention and an outer silicone seal for proven structural strength and durability.

This translates to a number of valuable benefits:

- Improved occupancy comfort
- Exceptional energy savings
- Sleek sight lines
- Excellent UV resistance and colour stability
- Structural strength against wind and snow loads

At home with saving energy (and the environment, too)

Energy efficiency - everyone's talking about it. You will already be aware that energy costs are increasing and reducing our carbon footprint is something we all need to think about. It's important to choose double glazing that not only will improve your levels of comfort, but also really save you energy and money – long into the future.

SOLOS Glass manufacture 5 different suites of IGU products:

- The KlymetControl® product range, designed for use in both the residential and the commercial market which incorporates a broad range of glass types dependent on the final performance requirements
- The KlymetControl® Plus product range which incorporates OptEseal™, a warm edge spacer solution for superior thermal insulation performance, improved structural strength and enhanced durability
- The OptEma™ product range, a superior performing IGU incorporating a specialised Low E glass manufactured specifically for the residential market
- The OptEma™ Plus product range which incorporates OptEseal™, a warm edge spacer solution for superior thermal insulation performance when glazed in a selected range of window and door suites
- The CoolRay™ range of IGU's incorporates a multi layer Low E coating for superior SHGC reduction whilst maintaining high levels of light transmission combined with exceptionally low U vales; the perfect combination for medium to high rise commercial projects.

An MHG Company

OptEma™

High Performance Insulated Glass

solos glass

see the possibilities

OptEma™ High Performance Insulated Glass

Creating your ultimate residential haven

The OptEma™ range of high performance insulated glass units (IGU) is specifically designed to balance the benefits of high levels of natural light transmission with outstanding levels of thermal insulation and overall energy efficiency.

Playing a key role in managing both the heat flowing in and the heat flowing out of the glazed elements of the building, OptEma™ helps to make your home cooler in summer and warmer in winter whilst allowing the room to bathe in very high levels of natural light.

Offering a broad range of glazing options and a host of additional solutions which help to create the ultimate residential haven, OptEma™ is an ideal IGU solution for both residential new build and renovation projects.

By offering a range of product combinations, OptEma™ IGU's provide solutions to a number of important criteria which both offer protection and add value to the home and its occupants.

OptEma™ - See And Feel The Difference

OptEma™ offers us the ability to feel at one with our environment whilst managing its key attributes and protecting us from some of its harsher elements. With demand increasing for high performance residential glazing which facilitates desired levels of natural light whilst achieving exceptional levels of energy efficiency and comfort, OptEma™ helps to provide the ideal solution.

OptEma™ Product Range

OptEma™ Combinations*	VLT	SHGC	U VALUE
4mm EnviroClear® // 4mm OptEma™	0.80	0.60	1.37
5mm EnviroClear® // 5mm OptEma™	0.79	0.59	1.37
6mm EnviroClear® // 6mm OptEma™	0.79	0.58	1.36
4mm EnviroTone® Grey // 4mm OptEma™	0.50	0.42	1.37
5mm EnviroTone® Grey // 5mm OptEma™	0.42	0.37	1.37
6mm EnviroTone® Grey // 6mm OptEma™	0.37	0.34	1.36
4mm Matlucent™ // 4mm OptEma™	0.80	0.60	1.37
6mm Matlucent™ // 5mm OptEma™	0.79	0.58	1.36
6mm Matlucent™ // 6mm OptEma™	0.79	0.58	1.36
6.5mm Silencia® // 5mm OptEma™	0.80	0.55	1.36
6.5mm Silencia® // 6mm OptEma™	0.78	0.55	1.36
6.38mm Protekta™ // 5mm OptEma™	0.78	0.56	1.36
6.38mm Protekta™ // 6mm OptEma™	0.78	0.55	1.36
7.52mm SecurView™ // 5mm OptEma™	0.78	0.55	1.35
7.52mm SecurView™ // 6mm OptEma™	0.78	0.55	1.34
6.38mm Protekta™ Translucent // 5mm OptEma™	0.61	0.46	1.36
6.38mm Protekta™ Translucent // 6mm OptEma™	0.60	0.46	1.36

*All glass combination data is based on a 12mm argon filled space as standard.

*All performance data is based on the Low E coating being on surface 3 of the double glazed unit.

OptEma™ High Performance Insulated Glass

Improved comfort

By helping to capture the high levels of natural light we value and manage the temperature levels we experience, OptEma™ plays a positive role in both contributing to our feelings of well being and creating the levels of comfort we all hope to experience from our home.

Increased use of room space

It is often the case that because people find it cold near windows that are not energy efficient, furniture is huddled near the centre of a room and space around the edges of the room is not utilised effectively. With the use of OptEma™ as the inner pane of an IGU, the actual temperature of the glass changes and becomes warmer. As such there are less cold downdraughts near the surface of the glass caused by convection and as such an increased amount of available room space to utilise. In particularly cold weather conditions the warmer temperatures of the glass panes help to minimise the chance of condensation forming on the room side of the IGU.

Safety

OptEma™ is available with both panes toughened to provide cost effective impact resistance for a wide range of applications requiring a Grade A safety glass. Alternatively the use of Protekta™ laminated glass within the IGU also provides Grade A safety along with other benefits such as additional protection from penetration through the glass, protection from UV rays which can fade furnishings and improved integrity of the glass panel if broken.

OptEma™ High Performance Insulated Glass

Security and resistance to unwanted entry

Offering high levels of resilience and protection from intruders wishing to break through the glass using hand tools or bricks in either a ‘smash and grab’ scenario or a more sustained attack, OptEma™ is also available incorporating SecurView™ security glass.

Noise reduction

The use of Silencia™ specialist acoustic laminated glass as one pane of an OptEma™ IGU helps to significantly reduce unwanted noise from a number of different sources, including traffic, trains and aircraft. The creation of your own personal oasis can be achieved whilst enjoying the high levels of light transmission and energy efficiency inherent in an OptEma™ IGU.

Reduction of UV fading

The use of any laminated product (Protekta™, SecurView™, Silencia™) within an OptEma™ IGU make-up, for either safety, security, privacy or noise reduction purposes, ensures a high level of resistance to UV penetration. This enables >99% of all ultra violet light to be screened out, in turn helping to protect carpets and furnishings from premature fading.

Privacy

Where privacy is a main concern, for example in bathrooms, an OptEma™ IGU can incorporate either a Matlucent™ or Protekta™ White Trans glass solution. Either solution offers excellent levels of opacity without compromising the levels of light transmission or energy efficiency.

OptEma™ High Performance Insulated Glass

Product options

OptEma™ incorporates one of the world's leading high performance Low E glass products within a hermetically sealed IGU which also incorporates an inert gas fill as standard and a choice of product from the extensive SOLOS Glass range as the additional glass panel.

- EnviroClear™ annealed or toughened Clear Float
- EnviroTone™ annealed or toughened Grey Float
- Matlucent™ annealed or toughened etched glass
- Silencia™ laminated Acoustic Glass
- Protekta™ laminated safety glass
- SecurView™ security laminated glass

OptEma™ - Increased Glazing Area

Because of its high performance characteristics, OptEma™ offers increased glazed area over that available through the use of normal clear glass. Also, because the Low E glass component used in the OptEma™ range comes in both 4mm and 6mm thicknesses, the maximum glazed area of an OptEma™ IGU is 6m^2* when used as a 2 x 6mm toughened glass configuration.

OptEma™ is available with spacer widths of between 6mm and 20mm, the finished thickness and final glazing of the double glazed unit being dependent on the rebate of the frame, the level of thermal insulation, the additional performance required or the size of the double glazed unit.

*Provided the selected combination is compliant with AS 1288

Minimum Size

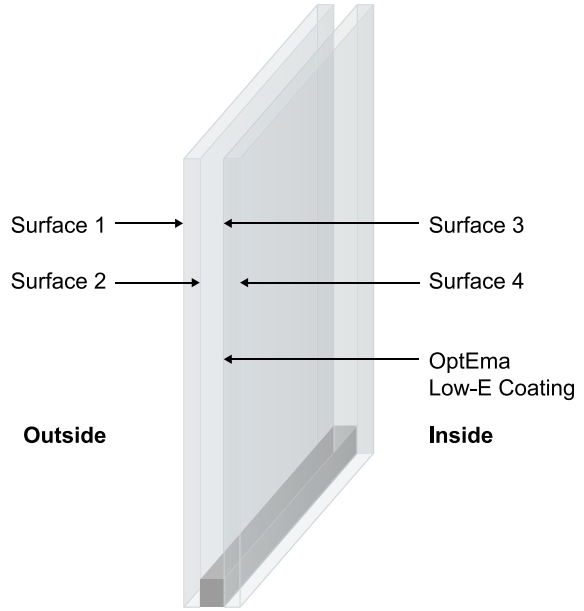
210mm x 410mm

Maximum Size*

2400mm x 3150mm

Spacer Widths

6mm – 20mm black aluminium (squares, rectangles and straight edge shapes).



OptEma™ High Performance Insulated Glass

Benefits

- Very high levels of light transmission with outstanding overall energy efficiency
- The OptEma™ high performance characteristics increases the glazed area of the home when compared to normal clear glass
- OptEma™ plays a positive role in contributing to our feelings of well being and creating levels of comfort we all hope to experience from our home
- Available in an overall thickness of between 14mm and 32mm to suit most window and door framing suites
- Helps manage the internal environment of the home by helping to control the amount of light and heat entering the home and the amount of heat leaving the home
- Argon gas filled IGU space as standard to improve thermal insulation performance
- Increases the amount of room space available by minimising cold down draughts near the inside of the window

Applications

- Fully framed residential windows and doors
- Rooflights

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OptEma™ Plus

High Performance Insulated Glass

solos glass

see the possibilities

OptEma™ Plus High Performance Insulated Glass

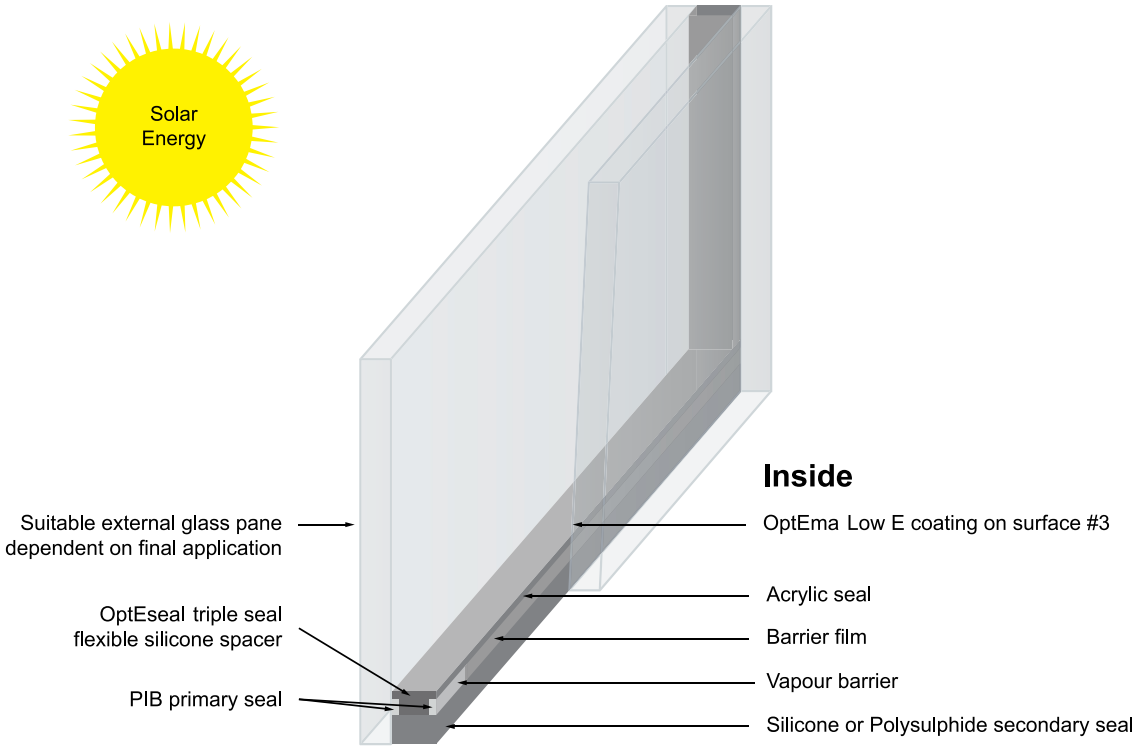
To complement the performance developments being made by Australia's window and door fabricators, we have taken the performance characteristics of our OptEma™ IGU product range and enhanced them even further.

Combining the product combinations and superior energy efficiency performance of the OptEma™ product range with the added benefit of the OptEseal™ warm edge IGU spacer, OptEma™ Plus plays a key role in maximising the overall energy efficiency performance of a selected range of glazed residential window and door suites.

By improving the overall thermal insulation of some window types by up to 9% compared to the same window glazed with the same glass make-up using a standard aluminium spacer bar, the OptEma™ Plus product range has been shown by the WERS assessment process to be producing some of the most energy efficient residential window and door solutions available in Australia

Driven by legislative requirements, the increasing cost of energy, a focus by framing manufacturers on introducing window profiles which reduce heat transfer and a developing knowledge amongst consumers of the role that the glazed elements of a building play in providing enhanced levels of comfort, the demand is growing for glazed window and door systems to become increasingly energy efficient.

That's where OptEma™ Plus comes into its own...



OptEma™ Plus High Performance Insulated Glass

Reduced Heat Conduction

Unlike an aluminium spacer bar, OptEseal™ has no metallic components. As such it is significantly less conductive, reducing the 'thermal bridge' effect, minimising heat transfer and subsequently reducing the total heat loss through the glazed window.

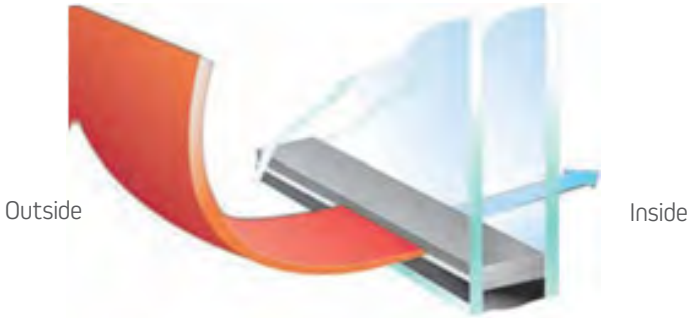
The result is an IGU which offers optimum levels of overall energy efficiency performance with some of the lowest total window 'U values' available.

Similarly, the OptEseal™ spacer reduces heat transfer from the outside to the inside through the spacer on warm or hot days, reducing the overall solar heat gain into the building.

By effectively blocking the heat path, on warm days the OptEseal™ spacer also enables the cooler air on the inside of the building to stay inside, enabling an OptEma™ Plus IGU to assist in providing a better controlled overall level of comfort to the home all the year round.

Prevents heat loss on a cold day

Reduces heat gain on a warm day



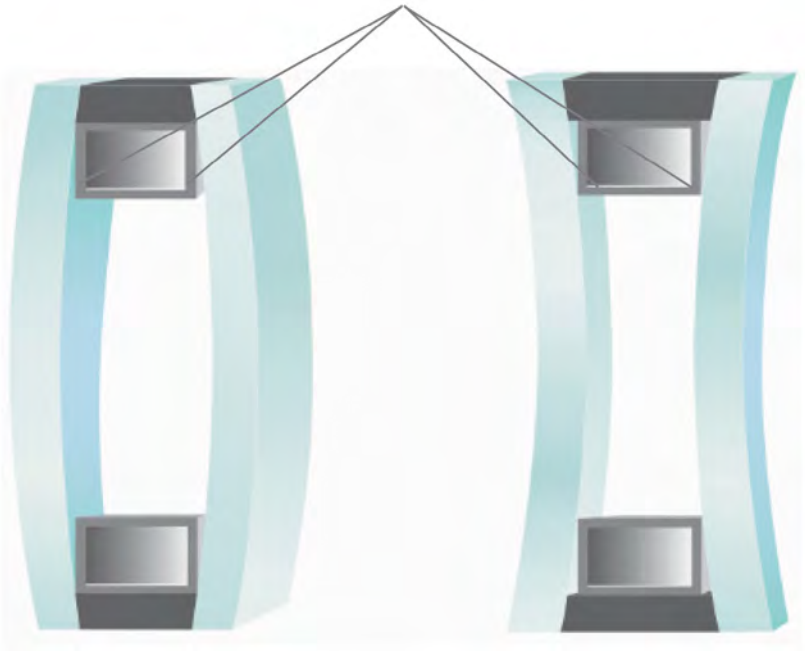
OptEma™ Plus High Performance Insulated Glass

Reduced Sealant Stress

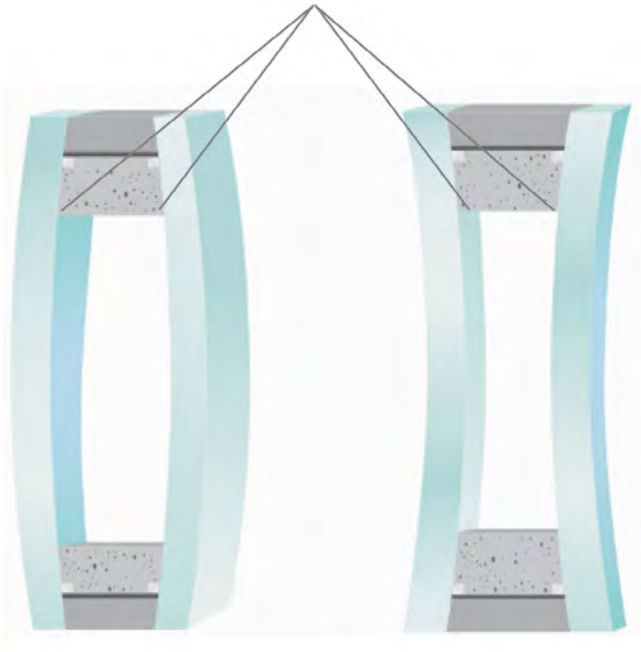
The OptEseal™ spacer used in the OptEma™ Plus IGU is manufactured using a thermoset silicone polymer material. As such it accommodates the natural expansion and contraction of the IGU caused by UV exposure, thermal expansion, wind loads and barometric pressure, always returning to its original shape.

This ability to expand and contract precludes any stress cracks and sealant movement which could occur when using standard aluminium spacers, which may lead to premature failure of the IGU.

IGU with aluminium spacer
PIB Not Contained



KlymetControl® Plus
Acrylic Adhesive, PIB Contained

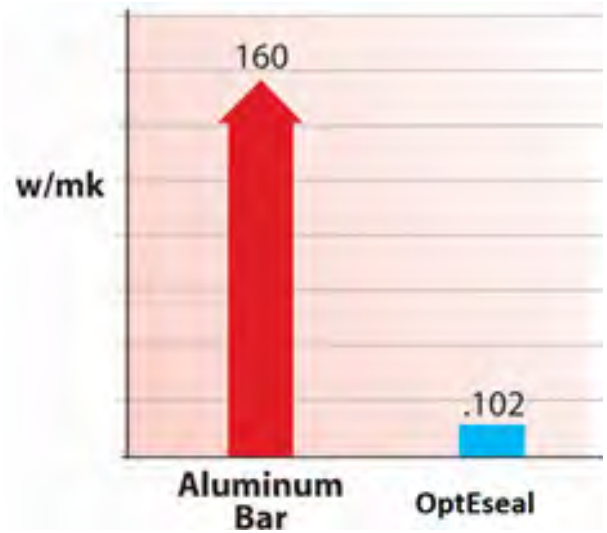


OptEma™ Plus High Performance Insulated Glass

Improved Heat Flow Resistance

The OptEseal™ spacer resists heat flow at a rate of 1500 times more than aluminium spacers. This translates to not only an improved overall energy efficiency of a window or door glazed with OptEma™ Plus, but also increases the temperature of the glass and significantly reduces the opportunity for condensation to form, in turn assisting in the prevention of mould and harmful bacteria growth.

By effectively blocking the heat path, on warm days the OptEseal™ spacer also enables the cooler air on the inside of the building to stay inside, enabling OptEma™ Plus IGU to assist in providing a better controlled internal environment all the year round.

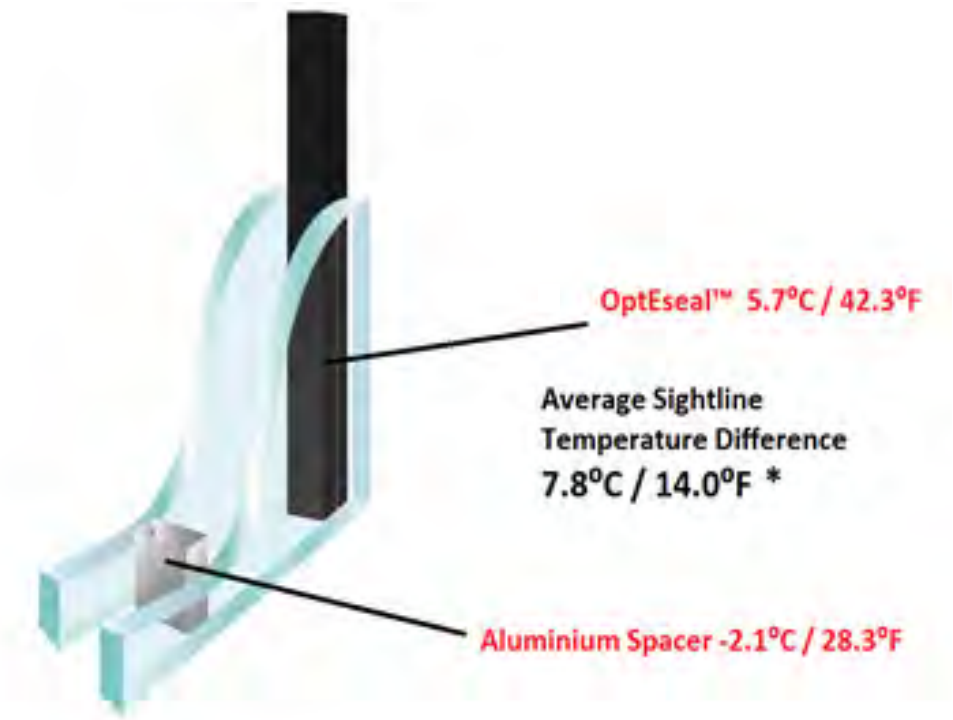


Higher Glass Temperature at the edge of the IGU

80% of the energy lost through a window occurs at the edge of the glass.

The OptEseal™ spacer has extremely low thermal conductivity in conjunction with the performance of the Low E coating within an OptEma™ Plus IGU means a warmer overall glass surface and less temperature variation across the surface of the double glazed unit.

In tests, IGU's glazed with a Low E IGU incorporating an OptEseal™ spacer showed nearly an 8°C improvement in the temperature at the sightline/edge of the glass when compared to the same IGU glass make-up incorporating an aluminium spacer, significantly improving the overall energy efficiency of the window system.



OptEma™ Plus High Performance Insulated Glass

WERS Performance

OptEma™ Plus has been assessed in a number of window suites as part of the Australian Window Energy Rating Scheme (WERS). The Window Energy Rating Scheme enables windows to be rated and labelled for their annual energy impact on a whole house, in any climate of Australia, details of which can be found at www.wers.net.

For specific details regarding the performance data of window suites incorporating OptEma™ Plus IGU's, please contact either the Sydney or Melbourne sales office or visit the WERS section in the Resource Centre.

Consistent Sightline

The absolute precision of the robotically applied OptEseal™ spacer results in clean, consistently flat sightlines on all 4 edges of the OptEma™ Plus IGU.

Further, the spacer is applied so it sits perfectly at right angles in the corner of the unit providing superb aesthetics with no spacer curvature.

*Simulations performed by Enermodal Enginnering Ltd using Window 5.2 and Therm 5.2 as per NFRC 100-2001. Outside temperature 0^0F, inside temperature 70^0F.

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safety

Glass that's strong by design

solos glass

see the possibilities

Safety Glass

The range of SOLOS Glass safety glass products are designed to reduce the potential for injury and protect people and property in the event of either accidental or deliberate glass breakage.

Manufactured in accordance with the requirements of both AS/NZS 2208 for architectural purposes and AS/NZS 2080 for automotive applications, the respective products within the SOLOS Glass Safety product range are manufactured and supplied for any application where the relevant Australian standard applies or where there is purely a desire to improve the level of safety and protection of individuals and/or property.

SOLOS Glass Laminated Safety Glass Products

Silencia™ - A range of acoustic laminated glass designed to reduce the level of noise transmission through the glazing from a number of different sources including traffic, aircraft and trains.

EnVision™ - A stunning premium quality digitally printed safety glass product designed to create a superior, dynamic visual experience for both interior and exterior applications.

Chroma™ - A decorative laminated safety glass incorporating a coloured interlayer, providing the perfect solution for both internal and external applications requiring either a dash of colour, a subtle hue or a dramatic, bold statement.

Valleta™ Laminated – Laminated Valleta™ mirrored glass providing a Grade A safety glass to AS/NZ 2208 and providing a solution for where a mirrored safety glass is required in order to meet the requirements of AS/NZ 1288 or AS 1735.2

KlymetShield™ Laminated – A range of energy efficient coated laminated glass products, glazed as single glass or as part of a KlymetControl® IGU, offering Grade A safety with excellent levels of thermal insulation, solar control and UV control.

Protekta™ - A range of Grade A safety glass products manufactured with either a 0.38mm or 0.76mm interlayer. The SOLOS Glass Protekta™ glass range includes products between the thicknesses of 5.38mm and 16.76mm.

Panoramic™ - Bespoke laminated safety glass panels specifically for a range of balustrade and glass fencing applications, which can also be specially engineered to provide safety solutions without handrails.

Safety Glass

SOLOS Glass Toughened Glass Products

TufGlas™ - a range of toughened safety glass products which has approximately four to five times more strength than normal annealed glass and is designed to shatter into small cube sized pieces when broken. TufGlas™ is used when strength, thermal resistance and Grade A safety are important considerations.

TufGlas™ HSK – an extension to the range of TufGlas™ toughened Grade A safety glass products which has undergone an additional heat soaking process to minimise spontaneous breakage due to any potential nickel sulphide (NiS) inclusions.

SOLOS Glass Heat Strengthened Glass Products

Resista™ - Whilst not a safety glass to AS/NZS 2208 unless glazed in its laminated form, Resista™ heat strengthened glass is approximately twice as strong as normal annealed glass and is ideally suited for applications requiring additional resistance to wind loads in line with the requirements of AS 1288 as well as offering additional protection against the effects of thermal stress.

Summary

Each of the products above can also be incorporated into a KlymetControl® IGU for energy management, acoustic or decorative applications requiring safety or security performance.

All laminated products can be supplied as bespoke toughened laminate products where either adherence to the Building Code or special additional levels of protection are required.

The locations and applications where safety glass needs to be considered are outlined in AS 1288 and include, amongst others:

- Balustrades and stairwells
- Overhead glazing and sloped glass
- Doors and door side panels
- Glazing in schools and day care centres where the glass is within 1000mm of the floor
- Any glass that could be mistaken for an opening

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laminated

Glass that's strong by design

solos glass

see the possibilities

Laminated Safety Glass

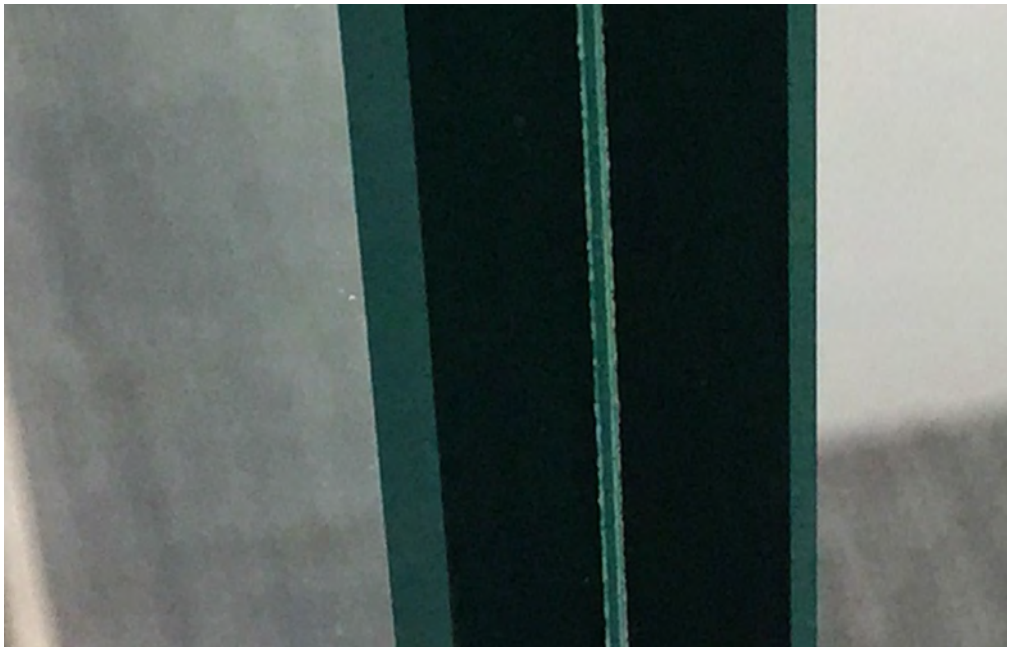
SOLOS Glass both manufactures and supplies laminated glass product for a number of different applications including safety, security, energy efficiency, decorative design and noise control; all meeting the respective requirements of both AS 1288 and AS/NZS 2208.

This range includes:

- Protekta™ Clear and Toned Safety Glass
- SecurView™ Security Glass
- Chroma™ Designer Coloured Panels
- Panoramic™ Balustrade and Glass Fencing
- KlymetShield™ Laminated Energy Efficient Safety Glass
- Silencia™ Acoustic Glass
- EnVision™ A stunning premium quality digitally printed high quality laminated safety glass

In addition to the range of standard laminate products almost any glass from the broad range of monolithic glass types available through SOLOS Glass can be custom laminated.

The potential combinations and tailored solutions available with a custom laminated product are extensive; blending the different solar control, thermal insulation, decorative and/or security options available to produce one of the most comprehensive ranges of Grade A laminated safety glass types available.



How is laminated safety glass manufactured?

Laminated glass is manufactured by permanently bonding 2 or more pieces of glass together with specialist interlayers during a carefully managed heat and pressure process in either an autoclave or non-autoclave laminating oven. Either process ensures that the glass permanently adheres to the interlayer and helps to keep the integrity of the laminated piece of glass intact, even if subsequently cracked or broken.

Dependent on the nature of the application and the level of resistance required from the laminated glass, the interlayers can be of varying thicknesses and either clear, toned or even incorporating a digital image dependent on the desired aesthetic or performance requirement of the final installation.

The majority of laminated glass products incorporate a 0.38mm thick interlayer, with thicker interlayers of 0.76mm, 1.52mm and 2.28mm being used to:

- Provide better adhesion to toughened glass surfaces in the manufacture of toughened laminates
- Encapsulate additional specialist inserts in products such as Chroma™.
- Provide additional strength and stiffness if broken
- Provide increasing levels of security.
- Provide improved noise reduction

These interlayers are usually either polyvinyl butyral (PVB) or ethylene-vinyl acetate (EVA), although specialist ionoplast interlayers are also available for when certain applications or specialist design features necessitate certain high load and tear resistance properties.

Unlike toughened glass, which breaks into a large number of small pieces when broken, laminated glass, whilst usually cracking in a spider web pattern, remains intact with any broken glass adhering to the interlayer material rather than shattering into thousands of tiny fragments.

Broken laminated glass

Broken toughened glass

Laminated Glass: Form and Function

Role of the Interlayer

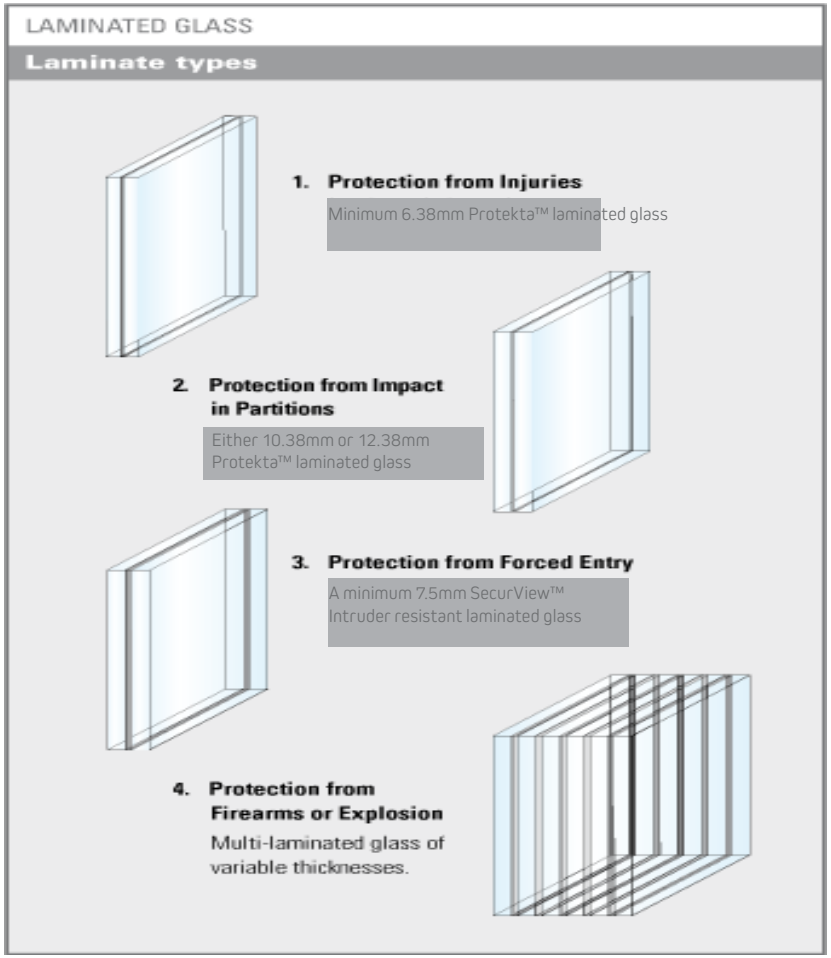
The interlayer between the glass panes is designed and manufactured not only to keep the glass panels bonded together if the panel should break, but also to prevent the glass from breaking into large pieces and falling from the frame or opening, protecting people as well as resisting penetration and maintaining a barrier.

Laminated glass has a number of benefits apart from its inherent safety properties, including protection from over 99% of all UV rays which helps prevent premature fading of furnishings and materials.

Available as stock, cut to size or be-spoke custom laminates

SOLOS Glass supplies a number of different laminated products for a broad range of specialist applications. These can be supplied either as stock, bulk processed products or custom, bespoke laminated combinations using a broad range of products from the SOLOS Glass glass range.

The potential combinations and tailored solutions available with a custom laminated product are extensive; blending the different solar control, thermal insulation, decorative and/or security options available.



Safety and Protection

The Protekta™ range of SOLOS Glass laminated products are manufactured using either a .38mm or a .76mm interlayer, with finished product thicknesses ranging from 5.38mm through 16.76mm. Supplied as stock product, cut sized product or as part of a KlymetControl® IGU, this suite of products fulfils the majority of the requirements of a laminated Class A safety glass in accordance with AS/NZ 1288 across a number of applications including:

- Low level glazing where a safety glass is required
- Any Grade A safety glazing requirement where distortion free glazing is required
- Windows, doors and sidelights in order to virtually eliminate the transfer of UV from the outside to the inside and inhibit premature fading of fixtures and furnishings.
- Internal glazing, partitions

However, as the use of glass extends to more specialised safety and security applications, a number of high performing laminated glass products are available using different types of glass and interlayer materials specific to the level of protection required and the type of application they are being designed for.

Different types and thicknesses of laminated glass are manufactured and/or supplied by SOLOS Glass to undertake specific roles in protecting both people and buildings.

Such products and applications include:

- Resisting forced entry and burglary – SecurView™
- Custom glass balustrades and fencing – Panoramic™

In order to provide additional levels of structural strength, resistance, security and overall product integrity or to meet building code requirements, toughened glass is sometimes used in place of standard annealed glass within the laminate make-up.

For further information on the Protekta™ range of laminated glass, please **click here.**

Security

Resists different levels of attack

Laminated glass plays an important role in offering buildings and their occupants high levels of security and safety by being able to resist different levels of attack by preventing penetration through the glass.

May crack but will stay intact

The glass will crack when impacted by a hammer, chisel or brick for example, although the glass will stay intact prohibiting or delaying entry.

Helps prevent unwanted entry

With many examples of break and entry being opportunistic, the delay in being able to penetrate through the glass sufficiently to force entry into the home or building invariably increases the risk of getting caught or being disturbed due to the noise generated. The role that a suitably glazed piece of laminated glass plays in preventing 'smash and grab' raids is therefore significant.

Please see the **SecurView™** section for further information.

Energy Management

Helps improve overall energy efficiency

SOLOS Glass offers a range of both stock products and custom energy efficient laminated glass make-up's to help manage the internal environment of a building. Many different laminated products are available to help meet specified levels of solar control, thermal insulation or overall energy efficiency. Stocked products include the different variants within the KlymetShield™ product range as well as number of custom laminated solutions incorporating products across the SOLOS Glass Energy range.

Additional benefits

Whilst helping to control both the amount of solar heat gain (solar control) entering a building and the amount of heat loss (insulation) escaping from a building, energy efficient laminated glass products offer a range of additional benefits including impact resistance, Class A safety and UV reduction.

Single glazed or IGU

Glazed either as single glazed or as part of a double glazed unit (IGU) in Residential or Commercial applications, for further information on the SOLOS Glass range of energy efficient laminated glass products, please visit the **Energy Management** section.

Solar control laminates

By using either toned glass or a toned interlayer as part of the laminate makeup, the level of solar control can be adjusted in line with the required internal solar heat gain, desired level of light transmission, level of glare, glazing aesthetics and internal lighting levels.

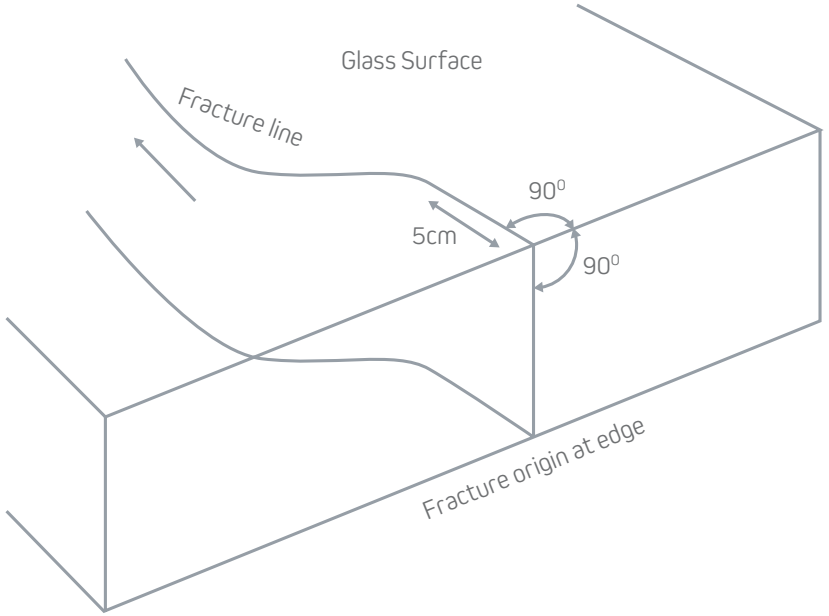
The standard range of toned laminated glass available is green, bronze and grey although a number of tones and high performance tones, for example Protekta™ SuperGreen, are also available where a specific performance or building aesthetic is required.

Glass Product	Normal Thickness	Visible Light Trans.	Visible Light Refl. Out	Solar Energy Trans.	Solar Energy Refl.	UV Trans.	U-value W/m2-C	SHGC	Shading Co.
Float - Toughened and Annealed									
ProtektaT™ Grey	6.38	42	5	47	6	<1	5.7	0.61	0.71
	10.38	41	5	42	5	<1	5.7	0.59	0.67
	12.38	41	5	41	5	<1	5.6	0.58	0.67
Protekta™ Green	6.38	71	7	63	6	<1	5.7	0.72	0.83
	10.38	70	7	57	6	<1	5.6	0.69	0.79
	12.38	69	7	56	6	<1	5.6	0.68	0.78
Protekta™ SuperGreen	6.38	65	7	30	5	<1	5.7	0.50	0.58
	10.38	65	6	31	5	<1	5.6	0.51	0.59
	12.38	64	6	30	5	<1	5.6	0.51	0.58

Thermal Stress Considerations

Care must be undertaken to ensure that the toned laminate does not require heat treating to avoid breakage by thermal stress. It is recommended that a thermal safety check is undertaken on the glass at an early stage to ensure breakage due to excessive thermal loading on the glass can be avoided.

Managing the solar control element of a buildings energy management program however is only one consideration. Increasingly the requirement of the glass and glazing is to not only manage the solar heat gain into a building, but to also manage the overall energy efficiency and energy consumption of the building by controlling the heat loss from the building; its thermal insulation.



Further information on our range of Protekta™ Laminated glass can be found **here** and in our **Energy Management** section.

Solar Control, Thermal insulation and energy efficiency

Helping to assist in reducing heat gain in Summer and heat loss in Winter, along with providing Class A impact resistance to AS/NZS 2208, blocking>99% UV transmission, the range of SOLOS Glass coated laminates can provide a key role in the energy management and overall safety management of a building.

The KlymetShield™ range has a history of providing a cost effective energy efficient glazing solution, which meets the requirements of the NCC/Building Code of Australia whilst, in its laminated form, providing a host of other benefits inherently associated with a laminated glass product .

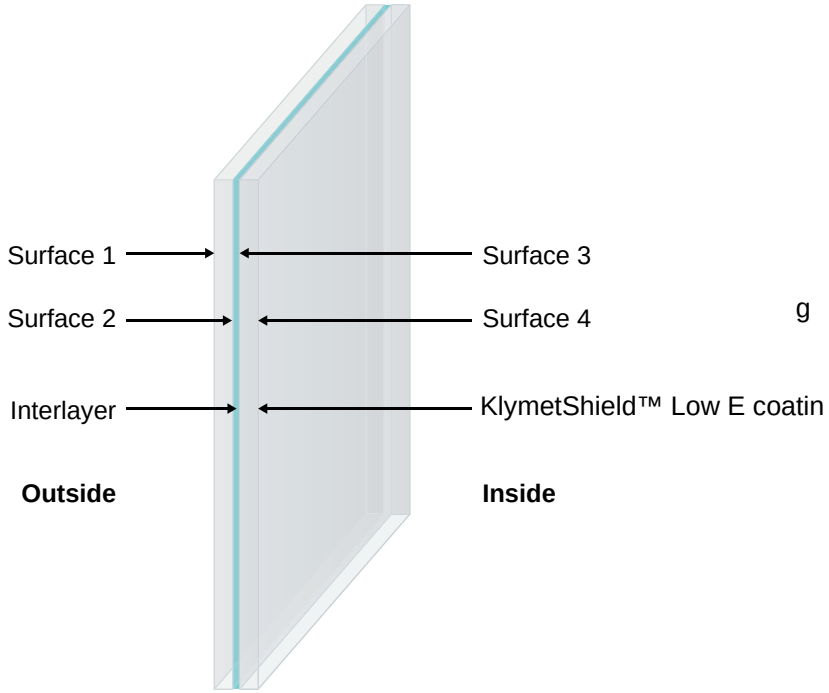
KlymetShield™ Laminated is available as a clear, neutral or toned Low E coated laminate product which assists in both the management of the solar heat gain into a building and also the reduction of heat loss from a building; enhancing the buildings overall energy efficiency whilst providing Grade A safety in accordance with AS/NZ 2208.

KlymetShield™ can be single glazed or, for improved performance, used as one panel within a KlymetControl® Insulating Glass Unit (IGU). The performance characteristics of the full range of KlymetControl® products can be found **here.**

When single glazing a coated laminate, it is important to glaze the glass with the coating to the inside of the building, i.e. on surface 4 as shown in the diagram below. This helps in improving the overall performance of the glass and protecting the coating from exposure to the elements.

It is possible for the coating to be placed on either surface 2 or 3 within the laminate, although placing the coating on either of these surfaces does not improve the U value of the glass over that of normal clear float glass. It does however improve the SHGC performance of the glass.

Further information on our range of Low E coated laminates can be found in the section on **Energy Management.**



Glass Product	Normal Thickness	Visible Light Trans.	Visible Light Refl. Out	Solar Energy Trans.	Solar Energy Refl.	UV Trans.	U-value W/m2-C	SHGC	Shading Co.
KlymetShield™ Laminated Clear (#4)	6.38	82	10	64	9	<1	3.6	0.68	0.79
	10.38	79	11	58	9	<1	3.6	0.64	0.74
KlymetShield™ Laminated Neutral (#4)	6.38	59	7	42	7	<1	3.6	0.51	0.60
	10.38	62	8	40	7	<1	3.6	0.49	0.58
KlymetShield™ Laminated Grey (#4)	8.38	37	6	27	6	<1	3.6	0.39	0.46
	10.38	38	6	26	6	<1	3.6	0.39	0.46

Acoustic Control

When compared to standard monolithic glass of a similar thickness, laminated glass has a more effective noise dampening effect and is particularly effective at reducing noise of higher frequencies such as voices.

Also, the use of laminated glass as one panel of a KlymetControl® IGU can help to further reduce unwanted noise being transmitted into a room. Consideration should also be given to using glasses of different thickness and incorporating as wide an air space as practically possible within the IGU.

To further improve the level of noise control, SOLOS Glass also offers specialist acoustic laminates within the Silencia™ range of products which are specifically designed to reduce unwanted noise to required minimum levels whilst also being as thin and lightweight as possible.

For further information on the role glass plays in noise reduction and further information on Silencia™, please visit our section on **Sound Management**.

Comparative Sound Insulation Data (dB)

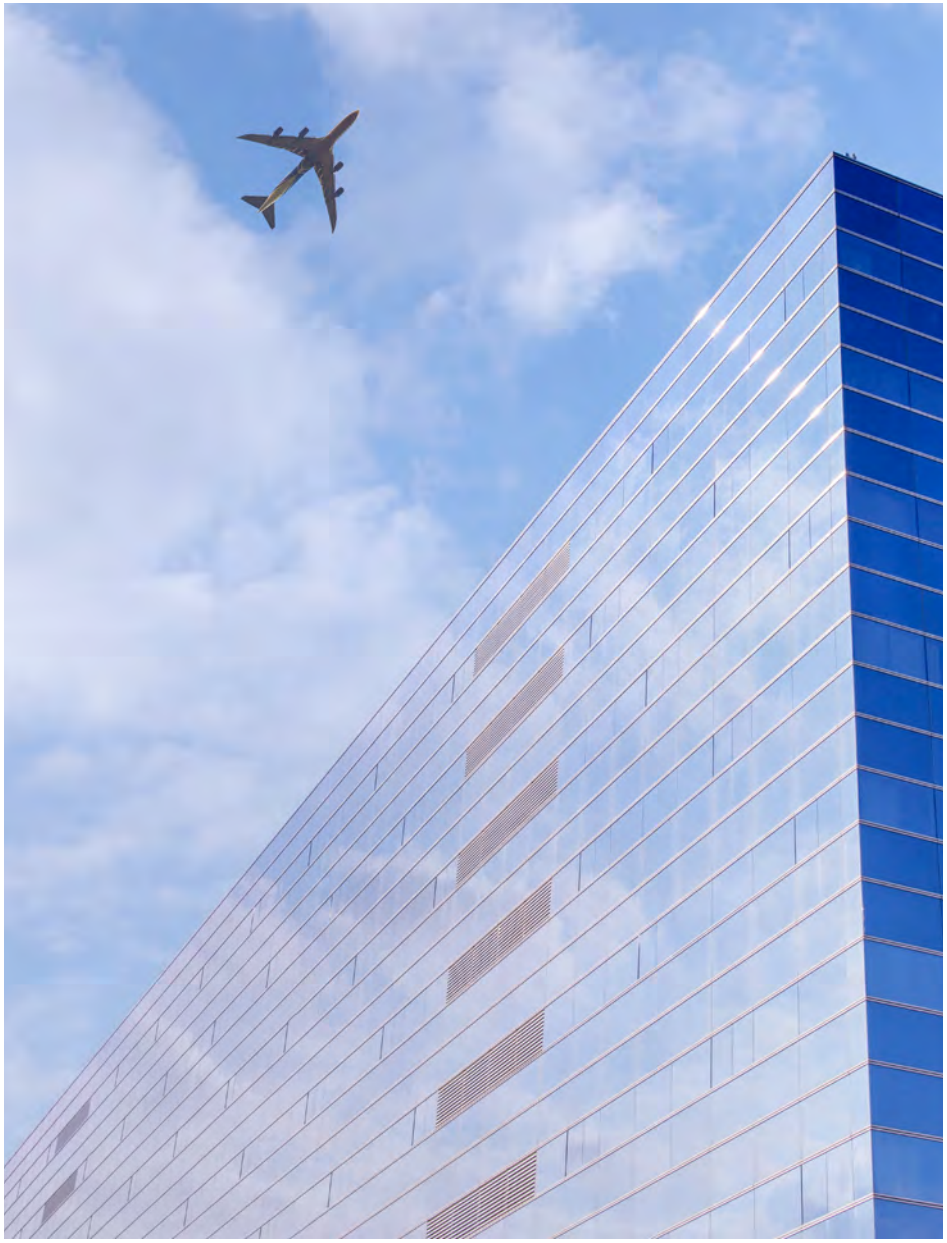
	Monolithic							Laminated			Silencia™			
Thickness	3	5	6	10	12	15	19	6.38	10.38	12.38	6.5	8.5	10.5	12.5
Rw rating (dB)	30	32	32	36	37	37	40	33	36	37	36	38	39	40

Resistance to Fading

One additional benefit of all laminated glass supplied by SOLOS Glass which is often ignored is that they absorb the UV radiation from the sun, resisting greater than 99.9% of short wave UV radiation being transmitted.

As such all types of SOLOS Glass laminated glass helps considerably in reducing UV transmission and preventing excessive fading of furniture and other soft furnishings.

This is especially useful for homeowners seeking to maximise the amount of space available to them in a room by arranging furniture adjacent to the windows.



Coloured Effects and Digital Images

Creative Inspiration

The Chroma™ and EnVision™ range of products have been developed specifically to inspire architects and interior designers to use glass in applications where normally it may well not even have been considered.

These products open up a whole new world of aesthetic and performance design with the use of both brilliant transparent and translucent colours and high resolution images respectively.

Chroma™

Simple yet stunning decorative and coloured effects can often be achieved by using any product within the Chroma™ range of coloured interlayers. Whether it is a dash of colour, a subtle hue or a dramatic, bold designer statement, Chroma™ is the perfect solution.

EnVision™

Where a be-spoke and highly individualistic digital image effect is required, EnVision™ provides the specifier and designer ultimate freedom to produce a picture perfect and unique expression.

Providing transparent, translucent, opaque and even mirror finish options, by utilising any product within the FGI glass range when used in its laminated form, EnVision™ allows the design process to be easily and dramatically communicated across a broad range of applications from complete building facades through to individual bespoke glass panels across a range of applications.

Laminated Glass - Key Features and Design Notes

- The typical interlayer thickness for a standard annealed laminated Grade A safety glass, such as Protekta™, is 0.38mm thick. Dependent on the performance criteria required and the nature of the application to be glazed, alternative interlayer thicknesses of 0.76mm, and 1.52mm thicknesses are available. For some specialist laminated products, special interlayer materials of varying thicknesses may also be used.
- For be-spoke laminates which incorporate either heat strengthened or toughened glass, a thicker interlayer material is used to ensure the maximum adhesion is maintained at the glass/interlayer interface. This is because when heat treating glass the surface can become very slightly undulating due to the heat treating process and is not as perfectly flat as standard annealed glass.
- It is recommended that laminates which have as part of their make-up either a toned or reflective glass undertake a thermal assessment prior to ordering. Dependent on the application, exposure to thermal stress and other factors, the glass maybe subject to stress which could induce breakage. Products shown to be at potential risk of breakage may have to be supplied as either heat strengthened or toughened laminated product to prevent breakage under thermal stress.
- Care must be taken when trying to match a toned laminated glass with toned annealed or heat treated float glass. Not all toned interlayers match the colours of monolithic toned float glass, regardless of their colour or source of manufacture. For example, if a building has a toned laminated safety glass adjacent to a toned float glass, the colours may not match. SOLOS Glass EnviroTone™ laminates are available manufactured using both toned interlayers and clear glass as well as clear interlayers and toned glass. Please contact our customer service function.
- Minor de-lamination at the edge of a piece of laminated glass can sometimes happen, although usually covered by the frame. Minor de-lamination, often up to 5mm in from the edge, does not affect the integrity of the glass or compromise its functionality.

In a situation when the edge of the glass is exposed and subject to moisture or thermal exposure, we recommend fully framing/glazing of the glass or, if the edge is to be fully exposed to the external environment, SOLOS Glass recommends the use of specialist interlayers which will neither discolour or de-laminate when exposed to the elements. One application where specialist interlayers are used for example is in the Panoramic™ range of products used for balustrading applications.

Laminated Glass - Key Features and Design Notes

Toughened Laminated Glass

In order to provide extra impact resistance or to improve the glass resistance to heat stress or loading stress, laminated glass is sometimes manufactured using toughened glass instead of annealed float glass.

When toughened laminate glass is manufactured the interlayer used is normally 1.52mm thick to ensure excellent adhesion with the surface of the toughened which can be slightly undulating due to the toughening process itself.

A characteristic of toughened laminated glass is that when it does break, the glass shatters as per standard toughened glass but remains adhered to the interlayer. Under such circumstances the glass may slump, which is why in certain applications, such as balustrading, glass fencing, overhead glazing or special security applications, the use of specialist rigid interlayers may be appropriate in order to retain a barrier.

Heat strengthened laminate

Used when there is a risk of breakage from thermal stress or wind loading, heat strengthened glass has a flatter surface than toughened glass, which for many improves the external appearance due to the reduced distortion of the glass surface. It is due to the improved flatness of the surface that most heat strengthened laminates require a thinner, 0.76mm interlayer, than a toughened laminate which uses a 1.52mm interlayer.

It is this appearance combined with the added strength of heat strengthened glass over annealed glass which often creates demand for a laminated heat strengthened glass when a safety glass needs to be used to meet the requirements of the NCC.

Whilst heat strengthened glass is not a safety glass in accordance with the Australian NCC in its monolithic state, in its laminated form heat strengthened glass is a Grade A Safety glass.

For further information on heat strengthened glass see the section on Resista™

Manufacturing and Supply Sizes

Maximum

- There are a range of stock sheet sizes available with a current maximum size of 5100mm x 3210mm. Please contact your local SOLOS Glass customer service.
- The maximum size of custom laminated glass manufactured by SOLOS Glass is 6000mm x 3210mm.

Minimum

- The smallest laminated panel that can be cut is 25mm x 25mm.
- Due to the gaps between the toughening furnace rollers, the minimum toughened laminate glass that can be manufactured by SOLOS Glass must have a diagonal of 250mm.

An MHG Company

Panoramic™

Balustrades and Frameless Fencing

solos glass

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Panoramic™ Balustrades and Frameless Fencing

What is Panoramic™?

Panoramic™ is a range of Grade A safety glass solutions suitable for both structural and infill balustrades and frameless fencing panels.

Ideal for both internal and external applications, Panoramic™ is manufactured to the highest possible quality standards helping to create the ambience associated with greater light and space whilst providing absolute peace of mind.

Available in toughened, laminated or heat treated laminated panels as standard, Panoramic™ fulfils the complete range of glass requirements needed to complement the range of 'deemed to satisfy' structural and infill balustrade panels.

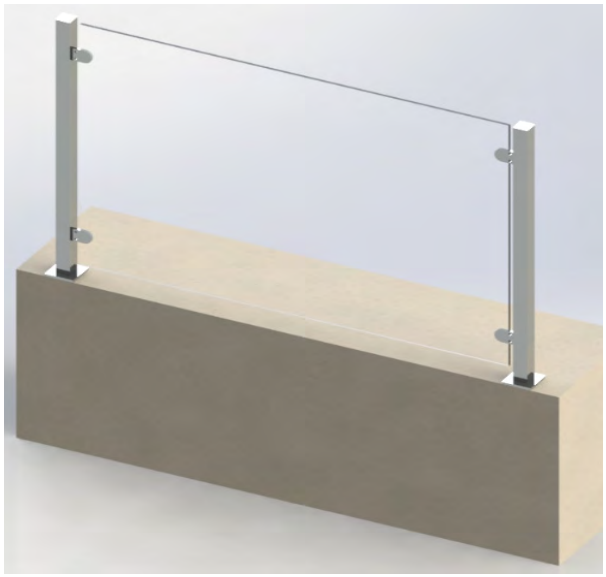
Panoramic™ can also be supplied as a specially designed custom toughened laminate for alternative solutions where handrails are not the preferred option and the difference in levels is greater than 1m.

Panoramic™ Balustrades and Frameless Fencing

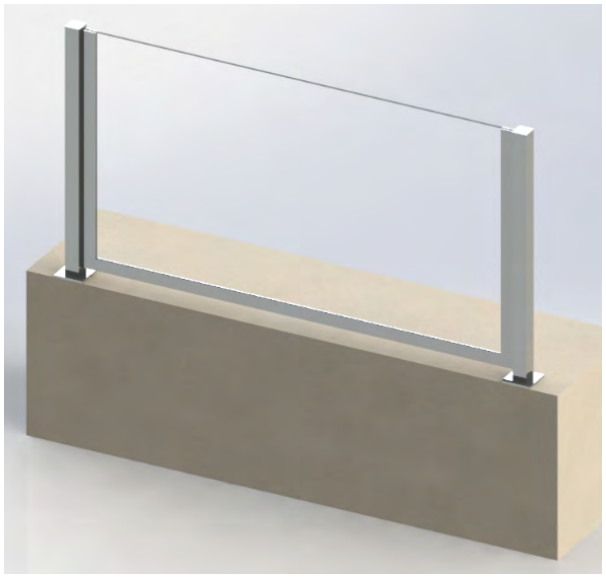
Panoramic™ is particularly suitable for a number of balustrade systems including, but not limited to the following:

Structural Balustrades

Two Edge Supported Structural Balustrade*



Three Edge Supported Structural Balustrade*



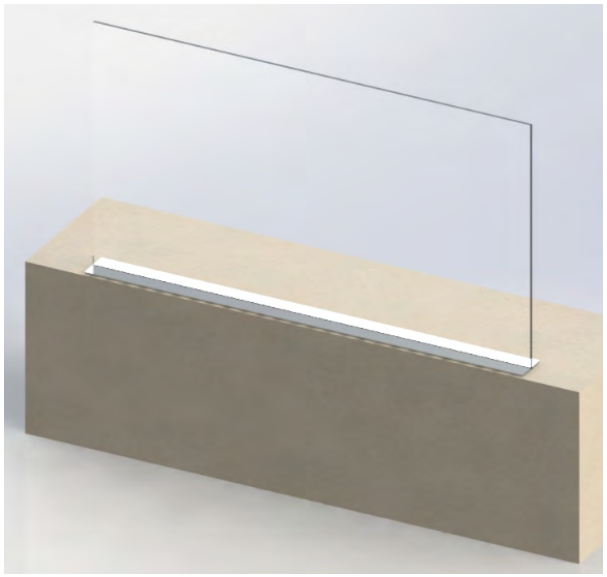
Four Edge Support Infill Balustrade

Panoramic™ Balustrades and Frameless Fencing

Two Edge Support Infill Balustrade

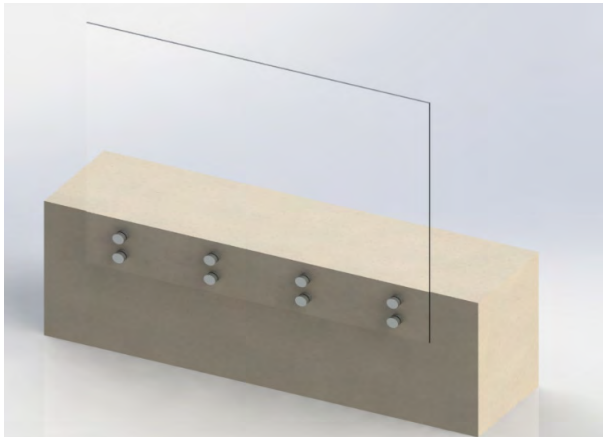
Two Edge Support Infill Balustrade (Mechanical Fixings)

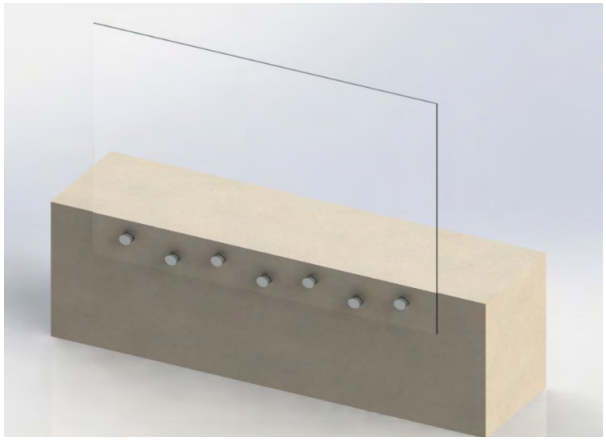
Cantilevered Glass Structural Balustrade*



Panoramic™ Balustrades and Frameless Fencing

Free Standing Point Fixed Balustrade*





Enhanced clarity

Panoramic™ extends design and aesthetic boundaries to maximise the effect of light and space while offering a truly outstanding safety solution. This can be further enhanced by the use of KristalClear™ low iron glass as either the toughened glass or the component glass panels within the laminated glass, offering a clarity and crispness not associated with standard clear float glass.

Durability and stability

When supplied in either annealed or toughened laminated form, Panoramic™ exhibits excellent resistance to moisture and temperature variation when used in external applications. Panoramic™ exhibits outstanding edge stability and adhesion, precluding delamination and yellowing of the interlayer.

However laminated Panoramic™ should not be considered to be 'waterproof' and care should be taken to prevent immersion of the glass edge in water or to allow water to pool on the edges of the glass for extended periods.

Custom engineered handrail free solution

For a solution where handrails are not the preferred option, Panoramic™ can be supplied as a specialist custom laminated product with a site specific certificate of compliance from a consulting engineer.

With this certificate, Panoramic™ can be customised as per the consulting engineers specification.

Each Panoramic™ panel must be specified and signed off by a structural engineer prior to manufacture.

For such applications, Panoramic™ incorporates a specialist interlayer which incurs minimal slumping in the rare occurrence of the glass breaking. In such circumstances the Panoramic™ interlayer is designed to retain an appropriate level of structural integrity and provide a sufficient safety barrier until the panel can be replaced.

All necessary engineering certification can be facilitated through our Customer Service Department to assist in the specification and design process.

*Handrail Free glass balustrades protecting a change in level of greater than 1m are not covered by AS 1288 and must have a Certificate of Compliance from a Consulting Engineer to be considered as an 'alternative solution'.

Panoramic™ Balustrades and Frameless Fencing

Benefits

- Maximises the effect of light and space whilst offering outstanding levels of safety and security
- Wide range of shapes and sizes available, fully compatible with a broad range of fixings
- For laminated Panoramic™ products, a 5 year warranty against delamination is offered. See our Warranty section for further details
- When supplied in any laminated form, Panoramic™ is highly resistant to moisture penetration and temperature variation ensuring it being able to be glazed with an exposed edge
- Wide range of glass types available, including EnVision™ Digitally Printed Safety Glass

Applications

- Balconies and barriers
- Internal and external, structural and infill balustrades
- Pool fencing
- Stairs, landings and walkways

An MHG Company

Protekta™

Laminated Safety Glass

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Protekta™ Laminated Safety Glass

Safety

Protekta™ is a widely stocked and easily processed entry level Grade A laminated glass product, primarily designed to provide cost effective Class A impact resistance for a range of relevant applications requiring a safety glass outlined in AS 1288.

Readily Available

Readily available and durable, Protekta™ is ideal for low level glazing applications to help provide safety for people making impact with the glass and/or to prevent injury through people or objects falling through the glass.

Suitable for overhead glazing

Protekta™ helps prevent objects from falling through the glass when used in awnings, roofing or overhead applications.

Distortion Free

Protekta™ is a perfectly flat and distortion free glass manufactured by permanently bonding two annealed pieces of glass together with the interlayer during a carefully managed heat and pressure process.

Maintains integrity even when broken

Protekta™'s manufacturing process ensures that the glass permanently adheres to the interlayer and helps to keep the integrity of the laminated piece of glass intact, even if subsequently cracked or broken.

Protekta™ Laminated Safety Glass

Protekta™ Interlayers

Available in a range of clear, translucent, low iron, textured and toned products, Protekta™ is manufactured in accordance with AS/NZ 2208 with either a 0.38mm or 0.76mm polyvinyl butyral (PVB) interlayer and is available in thicknesses of between 5.38mm and 16.76mm depending on the requirements of the application.

The increase in thickness of the interlayer increases the overall strength of the Protekta™ glass panel to enable increased load resistance as required by particular applications.

Toned versions of Protekta™ are manufactured with clear glass with toned interlayers, so care should be taken when trying to match a toned laminated glass with a toned monolithic glass to ensure consistency of appearance.

Protekta™ Solar Control Performace

Toned versions of Protekta™ help reduce glare and provide solar control by reducing Solar Heat Gain. Similar to toned glass, different coloured tones and different product thicknesses provide different levels of SHGC reduction.

However, unlike monolithic toned glass, for different thickness products within each colour range very similar levels of visible light transmission are offered by the product as the thicknesses increases.

Glass Product	Normal Thickness	Visible Light		Solar Energy		UV	U-value	SHGC	Shading
		Trans.	Refl. Out	Trans.	Refl.	Trans.	W/m2-C		Co.
Protekta™ Grey	6.38	42	5	47	6	<1	5.7	0.61	0.71
	10.38	41	5	42	5	<1	5.7	0.59	0.67
	12.38	41	5	41	5	<1	5.6	0.58	0.67
Protekta™ Green	6.38	71	7	63	6	<1	5.7	0.72	0.83
	10.38	70	7	57	6	<1	5.6	0.69	0.79
	12.38	69	7	56	6	<1	5.6	0.68	0.78
KlymetShield™ SuperGreen	6.38	65	7	30	5	<1	5.7	0.50	0.58
	10.38	65	6	31	5	<1	5.6	0.51	0.59
	12.38	64	6	30	5	<1	5.6	0.51	0.58

Protekta™ UV Reduction Performance

The interlayer used in the manufacture of Protekta™ blocks over 99% of ultraviolet radiation significantly reducing the effects of UV which can accelerate the fading and damage to furniture and furnishings.

Protekta™ Laminated Safety Glass

Protekta™ Glass Range

Glass Product	5.38mm	6.38mm	6.76mm	8.38mm	8.76mm	10.38mm	10.76mm	12.38mm	12.76mm	16.76mm
Protekta™ Clear	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Protekta™ Grey	✓	✓		✓		✓		✓	✓	
Protekta™ Bronze		✓				✓		✓		
Protekta™ Green		✓				✓		✓		
Protekta™ Green Plus		✓				✓		✓		
Protekta™ Dark Blue						✓				
Protekta™ Cool Blue			✓							
Protekta™ White Trans		✓		✓		✓		✓		
Protekta™ Texture Clear			✓							
Protekta™ Texture Grey			✓							
Protekta™ Soft White		✓				✓				

Benefits

- Cost effective Grade A safety glass to AS/NZ 2208
- Stockable and cuttable
- Breaks safely with glass pieces bonding to the interlayer and remains in the opening if broken. In certain applications, for example awnings and certain balustrades, the use of a toughened laminated glass is recommended
- Available in a range of thicknesses dependent on the application and/or size of finished glass required
- Easily incorporated within many KlymetControl® IGU products
- Highly resistant to UV penetration, screening out >99% of all ultra violet light, in turn helping to protect carpets and furnishings from fading.
- Distortion free
- Available manufactured with a range of different toned interlayers to suit different applications, aesthetic and performance requirements needed.
- Can provide more effective noise reduction when compared to the same thickness of float glass. For information on effective noise reduction, see the sections on **Sound Management** and **Silencia™**.

Applications

- Internal glazing, partitions
- Low level glazing where a safety glass is required.
- Overhead glazing and sloped glazing.
- Windows, doors and sidelights both to act as a safety glass and to virtually eliminate the transfer of UV from the outside to the inside.

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Resista™

Heat Strengthened Glass

solos glass
see the possibilities

Resista™ Heat Strengthened Glass

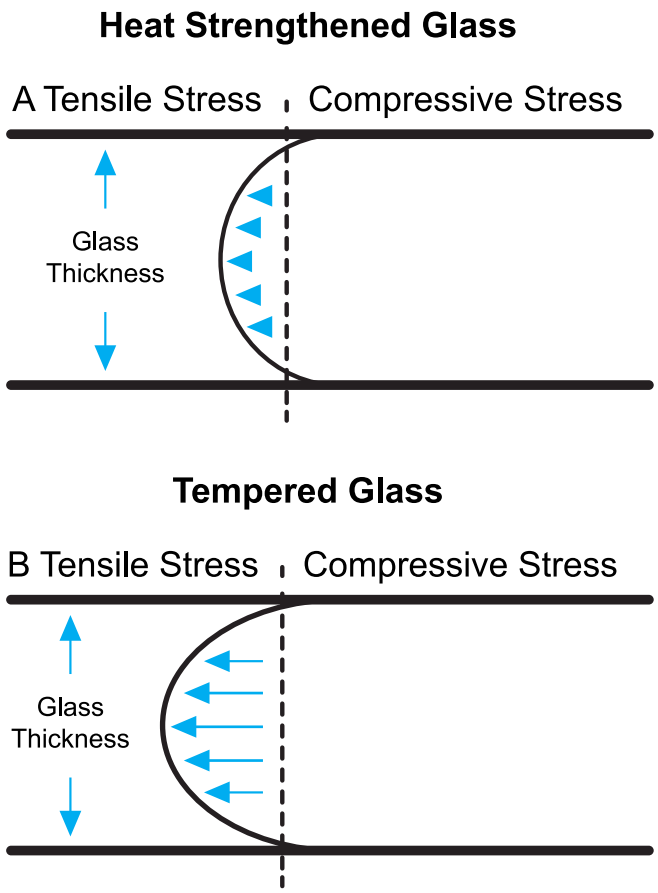
Resista™ is specifically manufactured for external windows, cladding and facade applications requiring additional loading resistance in line with the requirements of AS/NZS 1288. Whilst not a safety glass in accordance with AS/NZ 2208, Resista™ is the ideal choice for applications where additional resistance to wind loads and thermal stress is required, or for where there is no performance or regulatory requirement for the additional strength and safety properties of fully toughened glass.

Resista™ heat strengthened glass is manufactured in a similar way to TufGlas™ in that annealed glass is heated to approximately 650^{0}C in a tempering oven before being cooled with high pressure air nozzles in the quench.

However, because the glass is not being cooled as rapidly as fully toughened glass, whilst the outer surfaces of the glass are in compression and the inner part of the glass in a compensating tension, the levels of surface compressions are lower which results in the glass being only twice the strength of annealed glass.

The result is that Resista™ becomes thermally strengthened by inducing a surface compression/stress of between 24 and 69MPa compared to a surface compression/stress of >69MPa for TufGlas™ toughened glass.

Resista™ cannot therefore be considered to be a safety glass to AS/NZS 2208 and is not suited for applications where resistance to human impact is required and/or there is a need for mechanical fixing.



Resista™ Heat Strengthened Glass

Breakage Pattern of TufGlas™ Toughened Glass vs Resista™ Heat Strengthened Glass

If broken, Resista™ breaks into larger fragments than fully toughened glass which increases the potential for the glass to stay within the frame.

Resista™ also has the added benefit of having the appearance of being flatter than fully toughened glass and is therefore often the choice of specifiers for both the vision areas and spandrels of curtain walls or building façades.

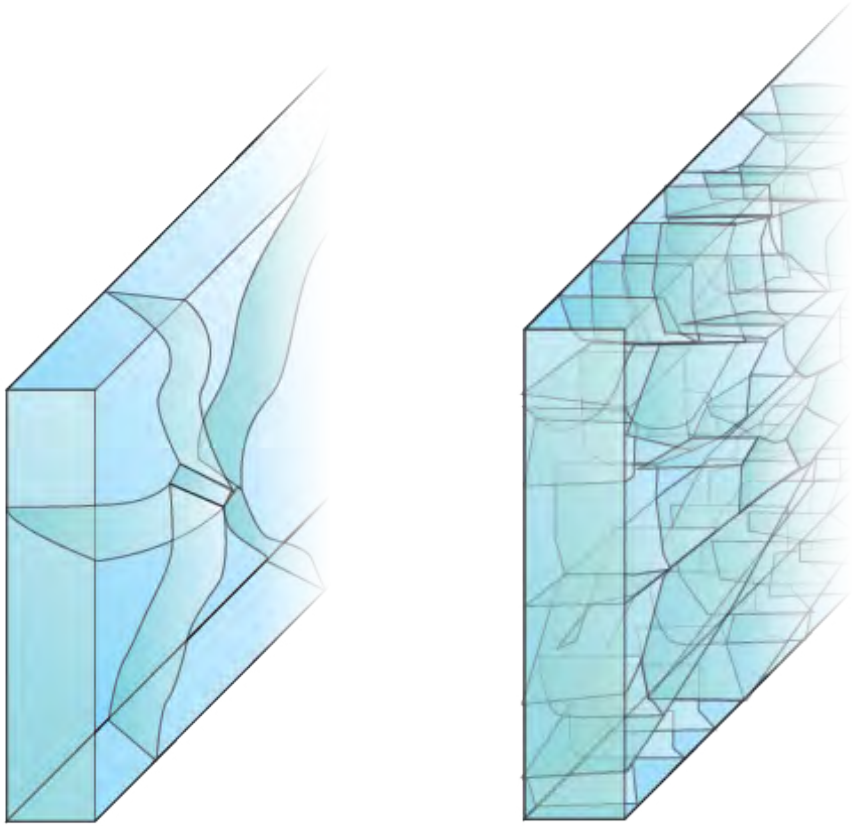
Benefits

- Flat distortion free surface with twice the mechanical strength of annealed float glass coupled with additional thermal resistance
- Often used in lieu of toughened glass in custom laminates to provide a flatter finish than that offered by a fully toughened custom laminate
- If broken, breaks into larger pieces than fully toughened glass with the pieces usually staying in the frame.
- Flatter finish offers less visual distortion

Applications

- Curtain walls and façades of medium to high rise commercial buildings
- Spandrel panels

Breakage patterns of Resista™ and TufGlas™



Resista™ Heat Strengthened Glass

TufGlas™ Toughened Glass

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TufGlas™

Toughened Safety Glass

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TufGlas™ Toughened Safety Glass

What is TufGlas™?

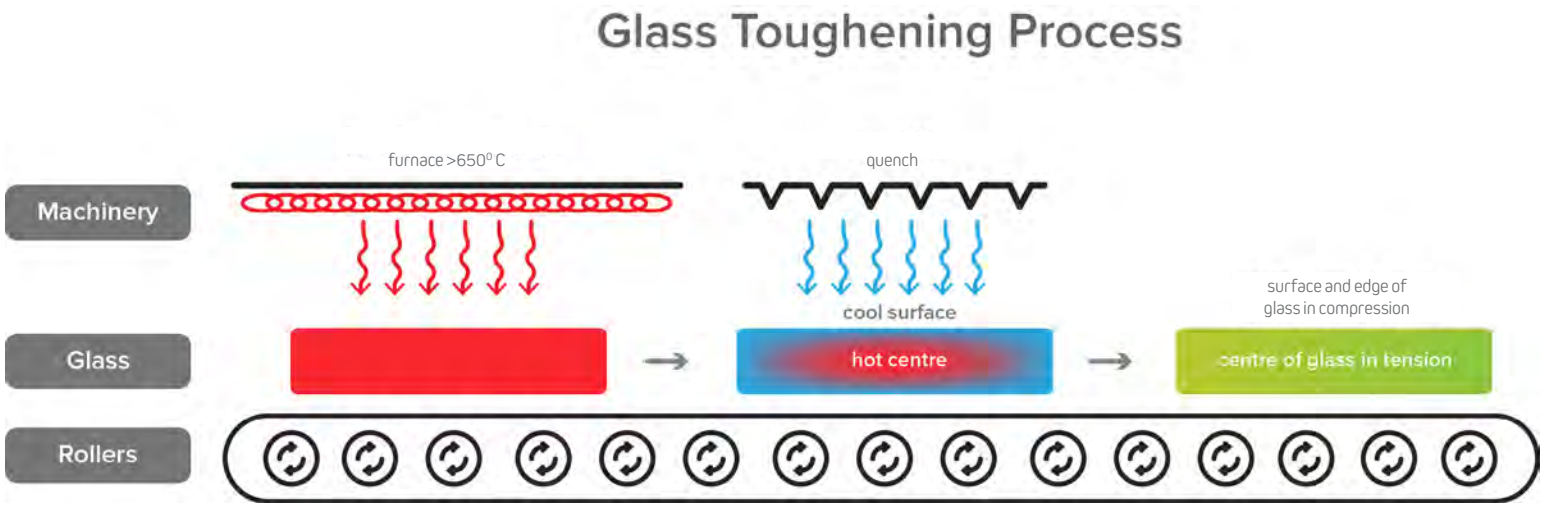
TufGlas™ is a Grade A safety glass available in a range of thicknesses from 4mm through 19mm. Most products within the SOLOS Glass product range are capable of being toughened or of having toughened glass components incorporated into their make-up.

TufGlas™ is four to five times stronger than normal annealed glass of comparative thickness and should be considered for use when additional strength, thermal resistance and/or safety are important considerations or where the building requires the use of a Grade A safety glass.

How is it manufactured?

TufGlas™ is manufactured by heating annealed glass on oscillating ceramic rollers to over 600°C and then cooling it rapidly through a series of high pressure air nozzles in an area of the toughened glass manufacturing line known as the quench.

This process locks the outer surfaces of the glass in a state of high compression, with the core or centre of the glass in a state of compensating tension.



These additional stresses built into the glass increases the glass's mechanical strength and also provides it additional thermal resistant properties. Withstanding temperature differentials of up to 250°C, the glass is also stable in temperatures ranging from -70°C to 300°C making it suitable for a number of applications where there is additional thermal loading on the glass.

Because TufGlas™ has its edges in compression with a state of tension in the glass' centre it cannot be cut or further processed once it has been heat treated.

TufGlas™ Toughened Safety Glass

TufGlas™ as a safety glass

Whilst approximately 5 times stronger than normal annealed glass of comparative thickness, if TufGlas™ does break, the stresses within the glass are released causing the glass to fragment into a large number of small granular pieces rather than large sharp edged pieces normally associated with broken annealed glass.

This type of breakage associated with toughened glass is designed to limit any injuries which may be caused by the glass breaking.

Whilst much stronger and more difficult to break than a comparative thickness of laminated glass, TufGlas™ cannot be considered a security glass without being laminated because once broken, the glass fragments can fall from the frame leaving a void where the glass once was.

TufGlas™ Product Range

Most of the SOLOS Glass glass range can be toughened to be subsequently supplied as either individual processed products or as a component of further fabricated products, such as KlymetControl® IGU's or a Panoramic™ toughened laminated balustrade. Please contact the relevant customer service department.

Because of its high level of mechanical strength, TufGlas™, unlike Resista™ heat strengthened glass, is readily suited to be used in conjunction with mechanical fixings. Please refer to the section **Drilled Hole Guidelines** for further information on the recommended placing of holes and notches in TufGlas™ toughened glass.

Broken Toughened Glass

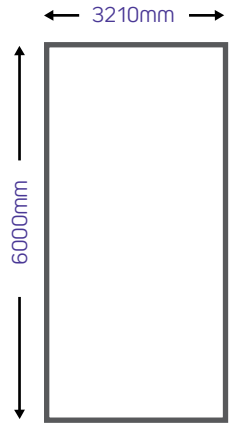
Broken Annealed Glass

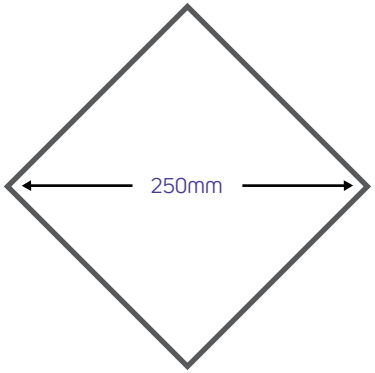
TufGlas™ - Toughened Safety Glass

TufGlas™ Manufacturing Guidelines

Maximum Size:
up to 3210mm x 6000mm

Minimum Size:
Diagonal length must be >250mm





Minimum Edgework:

SOLOS Glass has minimum requirements for the edgework finish on its range of TufGlas™ products.

4mm – 10mm thick: Minimum Rough Arriss finish

>12mm thick: Minimum Flat Grind finish

A clean cut edge is not available on any SOLOS Glass toughened glass product.

Toughened Identification Stamp

Each piece of TufGlas™ supplied by SOLOS Glass has a permanent identification stamp etched onto the glass. Usually located in either the bottom left or the bottom right corner of the glass, the stamp can also be located at a specific location on the glass if specifically requested by the customer.

TufGlas™ can be supplied without permanent marking at customers request with all necessary certification being available.

SOLOS Glass supply toughened glass for residential, commercial and automotive applications.

solos glass
PAS-Mark
AS/NZS 2208
GRADE A TP 4
CSI 2398

TufGlas™ - Toughened Safety Glass

Standards Compliance

TufGlas™ complies with the following standards:

- AS/NZ 2208 – Safety glazing materials in buildings
- AS/NZ 2080 – Safety glazing for land vehicles.

The criteria for the respective testing and subsequent rating of the glass as a safety product are clearly outlined in both documents.

How to Specify

Select Glass Name

SOLOS Glass TufGlas™

Select Thickness

4mm, 5mm, 6mm, 8mm, 10mm, 12mm, 15mm, 19mm

Select Product

EnviroClear™, EnviroTone™, EnviroTone™ Plus, KristalClear™, KlymetShield™, ThermoColour™, ColorSmart™, Panoramic™, Obscura™

Select Colour

Refer to SOLOS Glass Performance chart

Benefits

- Four to five times stronger than normal annealed glass of the same thickness
- Grade A safety glass manufactured to AS/NZS 2208 and AS/NZS 2080.
- Available throughout the SOLOS Glass float and rolled product range (with the exception of wired glass) in thicknesses of between 4mm and 19mm.
- SOLOS Glass have extensive experience in and knowledge of the manufacture of toughened glass products
- Can be used within a temperature range of between -70^{0}C and 300^{0}C, with a maximum temperature differential of 250^{0}C
- Broad range of suitable applications where a safety glass is required
- Available in a variety of edge finishes.

Applications

- Automotive/Transport
- Frameless Entry
- Glass Doors And Windows
- Hospitals And Schools
- Office Buildings
- Public Venues
- Residential, Factories
- Restaurants
- Splashbacks
- Sporting Facilities
- Shower screens
- ...and most commercial and residential applications, especially low level glazing, where a Grade A safety glass is required.

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TufGlas™ HSK

Heat Soaked Toughened Safety Glass

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TufGlas™ HSK Heat Soaked Toughened Safety Glass

What is TufGlas™ HSK

TufGlas™ HSK is a heat soaked toughened glass manufactured by SOLOS Glass specifically to minimise the chances of toughened glass spontaneously breaking due to the effects of Nickel Sulphide (NiS) inclusions in the glass.

Nickel Sulphide and toughened glass

During the float glass manufacturing process a number of minor imperfections become part of the glass substrate itself. Almost all of these imperfections are harmless and impossible to see with the naked eye. However, one imperfection that has been shown to more problematic than most is the presence of nickel sulphide or NiS.

Although harmless in annealed or annealed laminated glass, NIS can become a serious problem when it is found in toughened glass, potentially causing spontaneous failure of the glass.

One of the ways by which the potential issue of spontaneous failure of toughened glass can be significantly reduced is by the heat soaking of toughened glass.

How does NiS become a problem?

Existing in different forms at different temperatures, when subjected to the heating and rapid cooling process associated with toughening, the NiS inclusion can become locked in its high temperature modified form. Over time the inclusion can expand and potentially cause spontaneous breakage of the toughened panel.

What's the solution?

To help prevent spontaneous breakage through both NiS inclusions and other minor imperfections, SOLOS Glass recommends toughened glass be heat soaked, especially when the glass is to be glazed in structural applications or when safety is the overriding concern; eg balustrades, pool fences and overhead glazing.

TufGlas™ HSK Heat Soaked Toughened Safety Glass

What is heat soaking?

Heat soaking is a quality control process whereby toughened glass is heated and subsequently cooled to a specific time temperature cycle. This process accelerates the expansion of any nickel sulphide stones which may be present, in turn inducing any glass panels with nickel sulphide inclusions to shatter in the heat soaking furnace, not when they are glazed.

Whilst most glass breakages are the result of excessive loading, impact, defective edges, incorrect glazing or structural movement, the spontaneous breakage of toughened glass due to nickel sulphide inclusions can cause dramatic and catastrophic failure.

All SOLOS Glass heat soaking processing is carried out in accordance with EN14179-1:2005. Whilst not totally eliminating potential breakages by NiS inclusions, the heat soaking process will significantly reduce the risk.

Breakages in toughened glass caused by NiS inclusion can be clearly identifiable by experts because of the 'Butterfly Wing' breakage pattern immediately around the NiS inclusion.

Whilst slightly more expensive than standard toughened glass, when considered against the costs of replacing glass on site which have shattered due to NiS inclusions (often in difficult to access locations), the additional heat soaking process associated with TufGlas™ HSK provides excellent value for money.

TufGlas™ HSK Heat Soaked Toughened Safety Glass

Regulatory requirement

It is partly because of the threat posed by NiS inclusions that new provisions were included in the then BCA 2010 Volume 1, Class 2 to 9 buildings from May 2011 to incorporate mandatory provision of heat soaking in certain applications.

All glazed assemblies more than 5 m above finished floor or ground level must now incorporate measures to reduce the risk of breakages due to nickel sulphide inclusions.

It is now a regulatory requirement that when using toughened glass in these applications, it must have been heat soak tested in accordance with Clauses 3, 5, 6 and 12 and Annex A of EN 14179-1.

Benefits

- Significantly reduces the potential breakage of toughened glass due to nickel sulphide inclusions
- Excellent value for money reducing potential associated costs of replacing broken toughened panels
- Carefully controlled production process meeting the requirements of EN14179-1:2005
- SOLOS Glass were one of the first businesses in Australia to install heat soaking facilities and therefore have extensive experience in the manufacture and supply of heatsoaked glass

Applications

- Balustrading
- Glazed assemblies more than 5m above finished floor or ground level
- Overhead glazing
- Structural glazing applications

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security

Glass that protects all things valuable

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SecurView™

Laminated Security Glass

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see the possibilities

SecurView™ Laminated Security Glass

Ideal for use in retail shopfronts and doors, jewellery stores and display counters as well as residential windows and doors, the SecurView™ range of laminated security glass is designed to provide a clear transparent wall to assist in the prevention of unwanted intruder entry and smash and grab raids in both residential and commercial glazing applications.

Commercial Windows & Shopfronts

Incorporating an interlayer which, at 1.52mm, is 4x thicker than the interlayer used in standard Protekta™ laminated safety glass, SecurView™ offers high levels of resilience and protection from intruders wishing to break through the glass using such implements as hand tools or bricks in either a 'smash and grab' scenario or a more sustained attack.

Offering high levels of transparency without the distortion often associated with thicker glass, all glass within the SecurView™ range will assist in providing a barrier even if the glass is broken.

As a laminate the glass will continue to adhere to the interlayer even if broken or smashed, with the interlayer providing a significant barrier to further penetration. Compare that to toughened glass in retail shopfront applications which will, if broken, completely fall from the frame and remove any barrier to further entry or robbery.

SecurView™ is ideal for retail shopfronts, jewellery stores and display counters, not only because of the security that it offers, but also the >99% protection it offers from any UV transmission to minimise fading of both furnishings and retail stock.

Available incorporating just EnviroClear™ and a combination of EnviroClear™ and KlymetShield™ to help meet the requirements of Section J2, SecurView™ is also supplied incorporating KristalClear™ Low Iron glass to maximise the light transmission and visual clarity of retail goods.

Shopfront with broken laminated glass

Shopfront with broken toughened glass

SecurView™ Laminated Security Glass

Residential Windows and Doors

SecurView™ is suitable for a number of domestic window and door applications where security glazing is preferred and a consistency of appearance with the balance of the residential glazing is required.

Resistant to penetration by a range of commonly used tools and objects used for break-in and forced entry, SecurView™ can also be manufactured with any one of a range of toned interlayers for aesthetic or solar control purposes or Low E coated glass for enhanced overall energy efficiency.

SecurView™ can also be incorporated into a KlymetControl® double glazed unit for applications where superior levels of energy efficiency as well as safety and security are prime considerations.

How to specify

Select Glass Name:

SOLOS Glass SecurView™

Select Thickness:

7.52mm - Laminated

9.52mm - Laminated

11.52mm - Laminated

13.52mm – Laminated

Select Colour:

Clear, Grey, Bronze, Green, Cool Blue, Soft White or White Trans

Maximum Size:

up to 3210mm x 6000mm

up to 3210mm x 6000mm

up to 3210mm x 6000mm

up to 3210mm x 6000mm

Benefits

- Provides security to people, goods and buildings
- Maintains barrier to entry even when broken
- Withstands repeated efforts to break through, even with the most damaging of hand tools
- Range of thicknesses to maximise glass size
- Can be supplied using different glass types and offer increased resistance to breakage and offer increased resistance to breakage
- Virtually eliminates UV transfer through the glass, minimising fading of soft furnishings, promotional material or retail goods
- Can reduce noise levels when compared to similar thicknesses of annealed or toughened glass.

Applications

- Jewellery shopfronts and internal counter displays
- Residential windows, doors and skylights where there is a need for additional security.
- Retail shopfronts and doors
- Any residential or commercial glazing at risk from potential intruder attack

Glossary

A

Acoustic PVB (Polyvinyl Butyral) - A special interlayer incorporated into acoustic laminated glass types in order to significantly reduce noise as well as providing safe breakage characteristics of the glass. See **Silencia™**

Airspace - The cavity formed by the spacer bar between the two panes of glass in double-glazed units which can be filled with air or other inert gases such as Argon. All double glazed units manufactured by SOLOS Glass use argon for enhanced thermal insulation.

Annealed glass - During the float glass manufacturing process, the hot glass is gently and slowly cooled in the annealing lehr to release any internal stresses from the glass to enable the cutting and further processing of the glass post manufacture.

Argon gas - An inert gas used to fill the cavity within a KlymetControl®, KlymetControl® Plus, OptEma™ or OptEma™ Plus double glazed unit to further improve its thermal performance.

Arrissed edge - A basic form of edge working created by removing the sharp, clean cut edges of panes of glass. Arrissing creates a small bevel at an angle of 45 deg and can be achieved through manual processes or increasingly by fully automatic edge working machines.

Aspect ratio - The ratio of the longer side of a pane of glass to its shorter side.

Autoclave - A pressure tank vessel used to laminate glass through bonding the glass with the relevant plastic interlayers under high pressure and controlled temperature conditions.

AWA - The Australian Window Association which is made up of over 500 window manufacturers and industry suppliers throughout Australia. See **www.awa.org.au**

B

Balustrade – A (glass) panel protecting people from falling over a drop of greater than 1m. A balustrade can be framed or frameless, but must have a handrail if it is frameless to comply with AS 1288 as a deemed to satisfy solution. However, handrail free glass balustrades protecting a change in level of greater than 1m are available, although are not covered by AS 1288 and must have a Certificate of Compliance from a Consulting Engineer to be considered as an 'alternative solution'. See **Panoramic™**

Bevelling - The process of grinding and polishing a sloped angle on one face of the edge of flat glass which results in a decorative edge appearance to the glass.

Body Tinted Glass – Often referred to as toned or tinted glass, body tinted glass is manufactured by the addition of different metal oxides to the molten glass which do not materially affect the basic properties except for the colour and solar energy transmission. Common tints are grey, bronze, blue and green.

Brewster's Fringes - A rainbow effect sometimes seen in double glazing caused by the interference effects when light waves reflect from parallel panes of glass of identical thickness.This is NOT a fault in the double glazed unit.

Bullet Resistant Glass - A multiple lamination of glass and different interlayer materials designed to resist penetration from medium-to-super-power small arms and high-power rifles. Different thicknesses and product make-up's can be manufactured dependent on the level of bullet resistance required.

C

CNC Processing - Computer Numeric Control or CNC machines which are used to process sophisticated shapes, edge finishing and holes in glass prior to any heat treatment.

Coincidence Dip - The frequency at which a glass panel vibrates in unison with the frequency of the incident sound pressure waves thus significantly reducing the sound insulating properties of the glass at that specific frequency. See **Silencia™** and **Sound management.**

Cold zones - Areas close to the surface of the glass where exchange of heat by radiation can lead to the sensation of feeling cold or being in a draught. This is especially common in single glazed windows and is directly linked to a windows poor thermal insulation performance.

Colour rendering - Term given to the change in appearance of the natural colour of a material/object due to the colouration effect of light being transmitted through or reflected by the glass onto any given surface.

Condensation – When humid air is in contact with a cold glass surface, condensation forms as the vapour turns into a liquid.

Conduction – Driven by differences in temperature, conduction is the passage of heat through both the glass and the frame, transferred from molecule to molecule. Heat transfer increases with a greater difference in temperatures, the heat always moving from hot to cold. Different types of glass, different spacers within a double glazed unit and different types of frame material can affect the amount of heat transferred by conduction. See **KlymetControl®**, **OptEma™**, **OptEma™ Plus**, **OptEseal™** and **Energy management**.

Glossary

Convection – Convection is the transfer of heat through the movement of gases. When warm air within a building comes into contact with a cold window surface, it cools down and sinks. This creates a convection current of air adjacent to the glass surface. Moving air is a poor insulator allowing a greater amount of heat to be lost through the window conduction. This is one reason why it is important to increase the glass temperature of the inside panel of a double glazed unit through the use of a Low E glass and to also use a warm edge spacer which reduces the amount of heat lost through conduction at the glass' edge. See **KlymetControl®**, **KlymetControl® Plus**, **OptEma™**, **OptEma™ Plus**, **OptEseal™** and **Energy management**.

Countersunk Hole - A hole which has been ground out at the surface by either hand or automatically by a machine. Countersunk holes are often required to allow the flush glazing of a mechanical fixing in a balustrade or structural glazing system.

Curtain walling – A non-load bearing external façade cladding system, forming an integral part of a building's envelope. This is often used in high rise commercial buildings.

Curved glass - Glass, which is curved in form, produced by heating it to its softening point, so that it takes the shape of the mould.

Custom laminated glass – specially manufactured, be-spoke laminated glass usually comprising different glass types, heat treated glass and/or special performance interlayers.

Cutting – The manual or automatic scoring of the glass surface with a diamond wheel. The glass is subsequently snapped or broken out along the cutting score.

D

Decibel (dB) – dB is an abbreviation of decibel, the unit of measurement of sound. See **Sound management** and **Silencia™**

Deflection - The amount of movement of a glass panel which occurs perpendicular to the plane of the glass surface under load (usually wind load).

Delamination – Usually occurring at the edge of the glass, delamination occurs when one or more of the glass components of laminated glass loses its bond with the interlayer. This can be caused by prolonged exposure to water and subsequent water penetration into the laminate itself or through a reaction with an inappropriate glazing sealant.

Desiccant – A molecular hygroscopic substance used to remove/absorb moisture from inside the air space of insulated glass units. Desiccant is inserted into the hollow aluminium sections during manufacture of double glazed units or is an integral part of non metallic warm edge spacers. See **OptEseal™**

Design Wind Pressure - The specified pressure the glazing is designed to withstand as documented in AS/NZS 1170.

Double glazed unit - Also known as an Insulated Glass Unit (IGU), a double glazed unit comprises of two panes of glass separated by a cavity (usually containing air or argon) which is hermetically sealed by semi automatic or fully automatic manufacturing lines. See **KlymetControl®**, **KlymetControl® Plus**, **OptEma™**, **OptEma™ Plus.**

E

Edge clearance - The distance between the edge of the glass and the rebate.

Edge cover - The distance of the edge of the glass and sight line.

Edge sealer – Applied to edge of the glass, especially mirrors or laminated glass, to help prevent moisture affecting the component layers.

Emissivity - Emissivity is a surface characteristic of glass which gives it the ability to absorb and emit energy in the form of radiation. Low-emissivity (Low-E) coatings reduce the normally relatively high surface emissivity of the glass. The coatings are mainly transparent over the visible wavelengths but help reflect long wave infra-red radiation.

Energy Absorptance - The percentage of solar radiant heat energy absorbed and re-emitted externally and internally by the glass.

Ethylene Vinyl Acetate (EVA) – An alternative thermoplastic polymer to PVB used as an interlayer in the glass laminating process.

F

Façade - The front or face of a building.

Face - The term used to describe the surfaces of the glass in numerical order from the exterior to the interior. The exterior surface is always referred to as face 1. For a double-glazed unit, the surface of the outer pane facing into the cavity is face 2, the surface of the inner pane facing into the cavity is face 3 and the internal surface of the inner pane is face 4.

Fin - A vertical glass support fixed at 90 deg to the glass surface. Also sometimes known as a glass mullion, a fin is usually fixed behind a butt joint.

Glossary

Finger Slots - The slot produced by processing the surface of the glass by grinding in a slot for use as a finger grip to assist in sliding the glass panels.

Fire resistance - The ability of specialised glass and glazing systems to provide an effective barrier against the passage of flames, smoke and toxic gases (integrity) and, for certain glass types (integrity + insulation) to reduce the transmittance of radiated heat from the fire side to the non-fire side.

Float glass – Invented by Sir Alistair Pilkington in 1952, the float glass process involves melting a batch of different raw materials, including re-cycled glass, at 1600 deg C and pouring it continuously from a furnace onto a bed of molten tin. The molten glass floats on the surface of the tin before being pulled or drawn along out from the furnace by a series of rollers. The speed the glass is drawn determines the thickness of the glass. The glass then gradually cools or anneals before being cut and packed. See **EnviroClear™**, **EnviroTone™**.

Frequency - The rate of vibration of sound waves per second, measured in Hertz.

G

Gas Filling – The process of automatically filling a double glazed unit with argon gas during the double glazed unit manufacturing process.

Gasket - Pre-formed glazing materials used for bedding or securing glass and to separate the glass from the frame or fixings.

Glazing - The securing of glass into prepared openings. It also refers to the collective elements of a building comprising glass, frame and fixings.

Glazing materials - The materials required for the glazing of glass products such as glazing compounds, tapes, sealants and gaskets.

H

Hard Coat (Reflective & Low E) – The type of coating applied to one (the top) surface of the glass during the float glass manufacturing process. Also known as pyrolitic coating, the coating fuses to the surface of the glass, actually becoming part of the glass itself. Whilst the coating thickness is less than the thickness of a human hair, the coating is very durable and can be cut, toughened and laminated. See **KlymetShield™**.

Heat Soaking - Heat soaking is the process whereby toughened glass is reheated in a heat soak oven to a specific time/temperature curve to induce breakages that may be caused by inclusions or contaminants in the glass. Heat soaking is the method used to minimise any potential breakages from nickel sulphide inclusions (NiS), which, if undetected, can cause spontaneous breakage of toughened glass. See **TufGlas™ HSK**.

Heat-strengthened glass - Glass which has been heat-treated in order to increase its mechanical strength and resistance to thermal breakage. Approximately twice as strong as normal annealed glass, when broken it breaks into large chunks which tend to stay together rather than completely fall apart. Heat strengthened glass cannot be cut or drilled after heat strengthening and any alterations, such as edge-grinding, sandblasting or acid-etching, will weaken the glass and can cause premature failure. It is not classed as a safety glass in accordance with AS2208. See **Resista™**.

Heat-treated / heat treatment - A generic term for glass that has been heat-strengthened or thermally toughened in order to increase its mechanical strength and resistance to thermal breakage. See **Resista™**, **TufGlas™**, **TufGlas™ HSK**.

Horizontal line load - A linear uniformly distributed load applied horizontally at a given height above finished floor level. Most often associated with balustrade and guarding applications.

I

Impact resistance - When related to safety glazing this is the classification of safety glass when tested to AS 1288.

Infill panel - The term applied to the glass panel underneath the handrail in a barrier that provides containment, but no structural support to the main frame of the barrier.

Inner pane - The pane of a double-glazed unit which faces the interior of a building.

Insulated glass Unit (IGU) – Another term for a double glazed unit. Also called an Insulating Glass Unit. See **KlymetControl®**, **OptEma™** , **OptEma™ Plus**.

Integrity - The ability of glazing to remain complete and to continue to provide an effective barrier to flames (fire resistance) or impact resistance (safety) for example.

Interlayer - The term applied to the material used in laminated glass to bond the glass leaves together. It can be either PVB, EVA or a specialist ionoplast interlayer and can be of different thicknesses depending on the final application of the glass

Glossary

L

Laminated glass / laminate / laminating - Two or more sheets of annealed or heat treated glass are separated by one or more plastic interlayers and subjected to heat and pressure in order to ensure perfect adhesion between the components. If broken, the glass adheres to the interlayers to prevent the glass falling away. See **Protekta™**, **Silencia™**, **SecurView™**, **KlymetShield™ Laminated**.

Light Reflectance (R) - The percentage of visible light reflected by glazing.

Light Transmission - A term sometimes used to refer to the amount of visible light transmittance (VLT) through a type of glass, usually expressed as a percentage

Lehr - The annealing section of a float glass manufacturing line where the molten glass is subject to controlled cooling to obtain annealed glass, free from internal stresses, which can then be cut or worked.

Light transmittance (VLT) - The proportion of the visible light spectrum that is transmitted through the glass.

Loading - Generic term for the various loads, where relevant, exerted on a structure or elements of a structure including wind loads, snow loads, imposed loads for example those associated with accidental human impact, and dead loads such as self weight.

Location blocks - Small blocks of resilient material placed between the edges of the glass and frame to maintain edge clearance and to prevent relative movement between the glass pane and surround. Blocks used on the bottom edge of the glass are known as "setting blocks".

Low iron glass – Sometimes known generically as extra clear glass. Manufactured in a similar way to standard float glass, low iron glass uses materials with reduced iron oxide content in the batch mix to lessen the green tinge visible on the edge of ordinary clear float glass. Low iron glass has a very high light transmittance regardless of its thickness and has a clear or very light blue edge associated with it. See **KristalClear™**.

Low-emissivity / Low-E glass - low E coatings are clear or neutral in appearance and designed to reduce heat loss through the glass from inside the building, improve the level of insulation of the glass and window as well as reducing the amount of heat gain into the building. Low E coatings may also be incorporated into solar control coatings to provide the benefits of retaining heat in the building and reflecting heat from the sun providing improved overall energy efficiency. See **Emissivity**, **KlymetShield™**, **OptEma™**, **OptEma™ Plus** and **Energy management**.

M

Manifestation - Making glass visible. The marking of glass so as to minimise the potential for human impact and injury. Good examples are the horizontal markings on a sliding or patio door.

Mitre - The processing of the cut edge of the glass to an angle of approximately 45° (unless otherwise specified); the extreme point being slightly arrissed.

Monolithic Glass - A single piece of glass as opposed to a double glazed unit (IGU)or laminated glass

Multi-Laminates - Laminated glass comprising three or more pieces of glass.

N

Newton's Rings - A visual effect created when the centre of the glass panes making up an IGU come so close as to touch each other. It will appear as a circular or semi circular rainbow effect in the central area of the unit. This may indicate that the spacer width is too small, is the result of temperature related pressure changes or improper pressure equalisation of the IGU.

Nickel sulphide inclusion - A rare, but naturally occurring impurity that can, in certain circumstances, lead to spontaneous breakage of thermally toughened glass in service. One way of mitigating the occurrence of spontaneous breakage is to heat soak the glass.

Non-vision area - See Spandrel panels

O

'Off-line' coated Low E glass – Often called 'soft' or 'sputtered' coatings, such products are manufactured by applying multiple layers of thin metallic and oxide coatings to the glass surface after the glass has been manufactured in a special vacuum chamber on a separate coating line. Such coated glass types have to specially handled and processed and are only suitable for use in double glazed units, with the coating facing the inside air or argon filled space. Whilst historically heat treatment of the glass used to have had to take place before the glass was coated, modern 'off line' coatings are heat treatable, although still require to be used only in double glazed units. See Sputtered coating and **OptEma™**.

'On-line' coating – Coatings applied to the glass during the float glass manufacturing process before the glass is fully annealed. Often called 'pyrolitic' coatings as they applied to the glass surface whilst the glass is still hot, the specialist metallic oxide layer fuses to the surface of the glass as the glass anneals through pyrolysis and actually becomes part of the glass. As such the coatings are much harder than 'off line' coatings and much more durable meaning they can be handled and processed

Glossary

easier and can even be glazed monolithically (single glazed) if required. Products manufactured in this way include hard coated Low E glass and reflective solar control glass types. See Pyrolytic coating and **KlymetShield™**.

Opacified - Glass which has been fully enamelled or painted on one side to make it non-transparent.

Outer pane - The pane of a double-glazed unit which faces the exterior of a building.

P

Patterned glass - Translucent patterned glass of different levels of obscurity, manufactured by rolling semi-molten glass between rollers, the bottom one of which has an embossed pattern engraved on it, which, when annealed (cooled) becomes a permanent feature of the glass surface. See **Obscura™**.

Point load - An imposed concentrated load acting on a square contact area of 50mm sides. Most often associated with balustrading and guarding applications and also to glass used in floors.

Polished Edge – machine finished polished edge suitable for table tops, furniture and shelving which can have a flat finish and different angles of back mitre, usually of 22.5° or 45° angle.

Polished Wired Glass – Often called Georgian Polished Wired or GPW, it is a clear glass manufactured by inserting a wire mesh between two separate feeds of rolled glass. The glass is then ground and polished on both surfaces, removing 0.5mm of glass surface from both sides to produce a clear wired glass product.

Polyisobutylene - A butyl compound, typically the primary seal in a double glazed unit (IGU) and the key component in restricting moisture vapour transmission from the outside to the inside of an IGU.

Polysulfide – Used as a secondary sealant to seal the perimeter of double glazed units (IGU). However, if the edge of the double glazed unit is to be exposed to UV, a polysulphide seal will break down. In such circumstances silicone must be used as the secondary seal. As such, polysulphide must only be used when the IGU is fully framed.

Poly Vinyl Butyral (PVB) - A resilient plastic film used to bond glass together in the laminating process. Naturally opaque, PVB becomes clear during the laminating process.

Primary seal - A butyl-based sealant, for example polyisobutylene, applied to the edges of the spacer bar during assembly into double-glazed units, to ensure a watertight and airtight seal around the perimeter of the unit.

Pyrolytic coating / coated - A specialist metallic coating is applied to the glass "on-line" during the float glass manufacturing process. The high temperatures involved resulting the metallic oxides fusing into the surface of the glass through pyrolysis and effectively forming part of the glass. See 'On line' coatings & **KlymetShield™**.

R

RA,tr - The abbreviation for the sound reduction index when the spectrum adaptation term Ctr is applied to the single number weighted sound reduction index (RW) using traffic noise as a sound source.

Radiation – The process by which energy passes from its source to an object without heating the space between them, e.g. energy from the sun to earth.

Rebate - The section of the frame surround which forms an angle into which the glass is placed and held.

Reflective coating / coated - A metallic coating applied to one side of the glass in order to significantly increase the amount of reflection by the glass of both the visible and infra-red (light and heat) range of the electromagnetic spectrum which in turn improves the solar control properties of the glass.

Road traffic noise - See "RA,tr".

Rolled Glass - Glass formed by rolling molten glass in between two metal cylinders. Types of glass manufactured in this way include patterned glass and wired glass.

Rollerwave - An optical phenomenon, generally noticed in reflection, caused by contact between glass and rollers in the horizontal toughening process.

R-Value – Sometimes used to represent the thermal resistance of a glazing system. The higher the R-value, the less heat is transmitted throughout the glazing. The R-value is the reciprocal of U-value.

Rw – Rw is used to represent what is known as the Weighted Sound Reduction Index. It is a number used to rate the effectiveness of glass as an insulator against sound transmission. Increasing the Rw by one translates to a reduction of approximately 1db in noise level. As such, the higher the Rw number, the better level of sound insulation it will achieve.

Glossary

S

Safety glass – Laminated or toughened glass which must have passed an impact test (AS/NZS2208) and must either not break or must break safely. All SOLOS Glass laminated or toughened glass is a Grade A safety glass to AS/NZS 2208. See **Protekta™**, **TufGlas™**, **KlymetShield™ Laminated**.

Safety Mirror glass – Mirrored glass which is rated to Grade A in accordance with A/NZS 2208. Such glass can either have a sheet of organic material permanently bonded to one side of the mirrored panel so that the mirror holds together if broken, or, can be manufactured as a laminate with an interlayer in between the mirrored glass and a secondary pane of glass. See **Valleta™**.

Security Glass - Thick laminated, custom laminated or multi-laminated glass designed to withstand various forms of violent attack. Different thicknesses of security glass are available depending on the application and the level of security required. Security glass types should be considered separately to bullet resistant, cyclonic resistant and bullet resistant glass which require specific specialist product make-up's. See **SecurView™**.

Setting blocks - Generally rectangular cured extrusions of EPDM, silicone, rubber or other suitable material on which the bottom edges of glass are placed to effectively support the weight of the glass and avoid frame contact.

Shading coefficient (SC) - Now largely superceded by SHGC, SC is the ratio between the solar heat gain for a particular type of glass and that of 3mm clear float glass (0.87) and is used as a performance comparison. The lower the shading coefficient number, the lower the amount of solar heat transmitted.

Sight line - The edge of the opening that admits daylight.

Silicone seal – An alternative secondary edge seal to polysulphide used when the edges of double-glazed units are unframed and exposed to direct sunlight. They are sealed with silicone for UV resistance.

Silvering or silvered glass - A process used in the manufacture of mirrored float glass, whereby a silver coating is applied to one surface of the glass, subsequently protected by a series of additional coatings. See **Valleta™**.

Snow load - An imposed load exerted onto a structure or element of a structure by formation of snow.

Solar control glass – A toned or specially coated glass used to absorb and/or to reflect solar energy to prevent excessive heat gain. See **EnviroTone™**.

Solar Heat Gain Coefficient (SHGC) - Glass manages the solar heat gain allowed into a building through the amount of heat it reflects and the amount it absorbs. When solar energy hits the glass surface, some will be reflected away, some will be absorbed and re-radiated back inside the building and some will be directly transmitted. The total amount of heat transmitted through the glass into the inside of the building is represented by the SHGC. Each glass type has a different SHGC. The lower the number the better the solar control performance of that particular glass product.

Sound reduction index (R) - A laboratory measure of the sound insulating properties of a glass in a stated frequency band.

Spacer bar - An aluminium bar or special foam material (OptEseal™) manually or automatically fixed along all edges of the inside of a double-glazed unit, which separates the two panes of glass and creates a cavity. Aluminium bars are filled with dessicant whereas OptEseal™ has dessicant already embedded in it to absorb any moisture which may reach the inside of the double glazed unit.

Spall - Small fragments of glass that are ejected from the surface of a piece of glass sheet when the opposite surface is impacted. Certain laminated glass types can have an 'anti spall' piece of glass laminated to them on one side to mitigate spall, for example bullet resistant glass.

Spandrel or spandrel panel - Spandrel glass is the non-vision area of glass panels that conceal structural building components such as columns, floor slabs, heating, ventilating and air conditioning (HVAC) systems and is commonly used in curtain walling glazing. They generally comprise an enamelled/painted glass such as ThermoColour™ or ColorSmart™.

Sputtered coating / coated – See 'off line' coated

Stepped-edge – For certain applications, the edges of the double-glazed unit or custom laminated make-up are required not to be flush. One pane is larger and overlaps the other, to enable their use in roof glazing for example. Incorporating an exposed edge, stepped IGU's are invariably manufactured using a silicone secondary seal.

Stress Pattern - A specific geometric pattern of iridescence or darkish shadows that may appear under certain lighting conditions, particularly in the presence of polarised light. (This is often more readily noticed in toughened sidelights and backlights in a car by drivers wearing sunglasses). The phenomenon is caused by the localised stresses imparted by the rapid air cooling of the toughening operation in the quench. Stress pattern is characteristic of all heat treated glass.

Structural glazing - Glass acting as a structural support to other parts of the building structure, for example glass fins. It can also refer to glass that is fixed by means of bolted connectors where the glass is not acting as a structural element.

Glossary

Structural sealant glazing - An external glazing system where the glass is bonded to a carrier frame without mechanical retention.

Surface Position – The number denoting which face of a pane of glass or insulating glass faces the inside or outside of the building and is often used to highlight the orientation of coated glass, either as single glazed or as part of an IGU.

T

Tempered glass - See toughened glass/**TufGlas™**.

Textured glass - See Patterned glass/**Obscura™**.

Thermally broken - A type of metal frame that incorporates an isolating material of low thermal conductivity located between the inner and outer parts of the frame in order to reduce the rate of heat loss through the frame.

Thermal stress - The term used to describe the internal stresses created when glass is subjected to variations in temperature across its area. If the temperature differentials in the glass are excessive, the glass may crack. This is referred to as thermal breakage or fracture which is recognised by the initiation of the crack being exactly 90 deg to the edge.

Toughened glass - Glass that has been subjected to a controlled heating and cooling process in order to significantly increase its resistance to mechanical and thermal stress. Fully toughened glass is approximately 4 to 5 times stronger than annealed glass of the same thickness when exposed to uniform static pressure loads, although if broken, will fracture into many small pieces. See **TufGlas™**.

Toughened Laminated Safety Glass - Laminated safety glass utilising two panels of toughened safety glass in the make-up.

Tight size - The actual size of an opening into which glass is to be glazed.

Tinted glass – Also known as toned glass, tinted glass is manufactured on a float glass line by adding different materials to the batch mix dependent on the colour or tone required. Used mainly as a solar control glass to reduce heat gain into a building, different coloured toned glass produce different levels of visible light transmittance and solar heat gain as well as different aesthetics. The colour extends through the glass thickness and the thicker the glass, the darker the colour and the different the solar control performance. Different 'hard' and 'soft' coatings can be applied to tinted glass to create different aesthetics and performance characteristics. See **EnviroTone™**, **KlymetShield™**.

Tinted interlayer - A coloured plastic or resin sheet placed between two or more panes of glass to produce a range of decorative laminated safety glass products. See **Chroma™**.

Translucent - Transmitting light but obscuring clear vision. See **Obscura™**, **Protekta™**.

U

U-value - A measure of air-to-air heat transmittance (loss or gain) due to thermal conductance and the difference in indoor and outdoor temperatures. As the U-value decreases, so does the amount of heat that is transferred through the glazing material. The lower the U-value, the better the insulation. U value is expressed as Watts per square metre, per degree Kelvin, (W/m2K), or Watts per square metre, per degree centigrade, (W/m2°C).

UV transmittance - The percentage of solar energy in the form of ultra-violet radiation transmitted by glazing. Long-term exposure to UV light may result in fabric and pigment fading, deterioration of plastics and changes to the appearance of many types of wood. Using a laminated glass such as KlymetShield™ Laminated or Protekta™ significantly reduces the amount of UV transmitted through the glass.

V

Vertical glazing - Glazing which is either true vertical, or within 15° either side of true vertical.

Vinyl Back Mirror – A mirror which has a sheet of organic material/safety backing permanently bonded to one side so that the mirror holds together if broken. See **Valleta™ VB**.

Visible spectrum/Visible light -Part of the electromagnetic spectrum, with wavelengths from approximately 380nm to 780nm, to which the human eye is sensitive.

Vision area - Areas of a façade which allow vision from the interior to the exterior.

W

Warm-edge - Refers to the reduction of the thermal bridging effect around the perimeter of double-glazed units by replacing the conventional aluminium cavity spacerbar with a low heat-conductive thermally insulating cavity spacer. See **OptEseal™**.

Warm Edge Spacer – A non metallic spacer material used to separate the panes of glass in a double glazed unit which helps improve the thermal properties of both the glass and the window, reducing condensation and reducing u values/improving thermal insulation performance. Warm-edge spacers can significantly reduce heat conduction when compared to conventional aluminium

Glossary

spacers. See **OptEseal™**.

Weighted noise reduction - A single figure rating for the sound insulation of building elements. Includes a weighting for the human ear and measures actual sound transmittance.

Wind load - The pressure, positive or negative, acting on an external surface of a building caused by the direct action of the wind. Commonly expressed as N/m2.

Window Energy Rating Scheme (WERS) - A scheme launched in 2007 by the Australian Window Association (AWA), to assess the whole of window energy performance of window or door systems; including the frame, the glass and all associated components.

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