

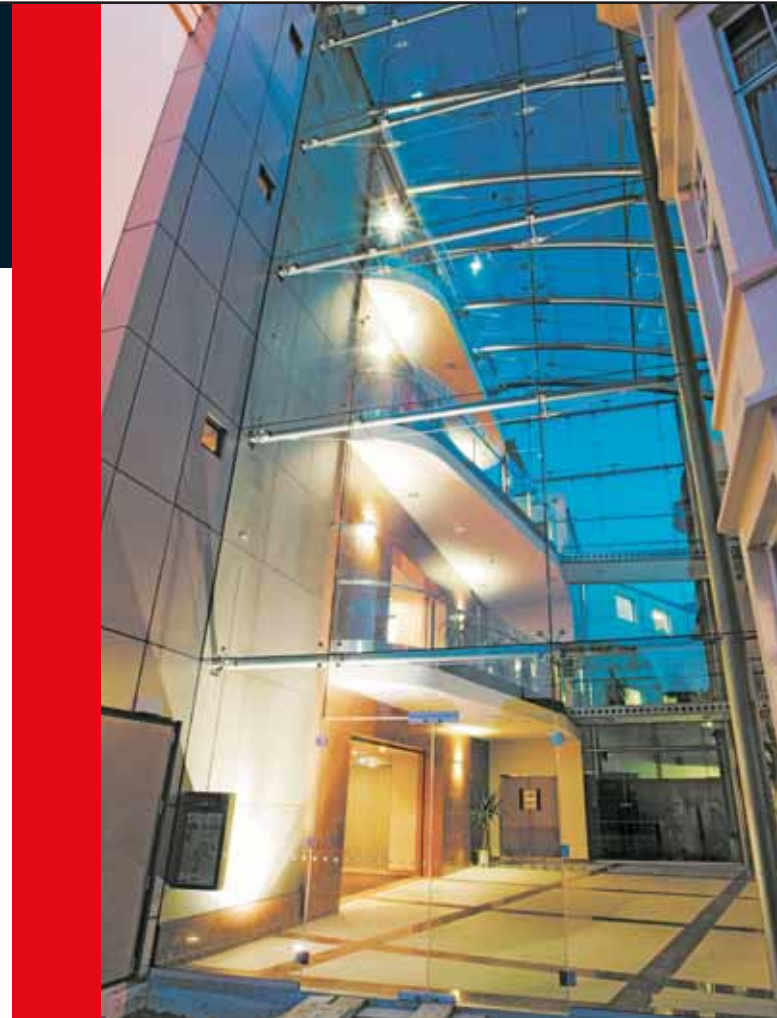
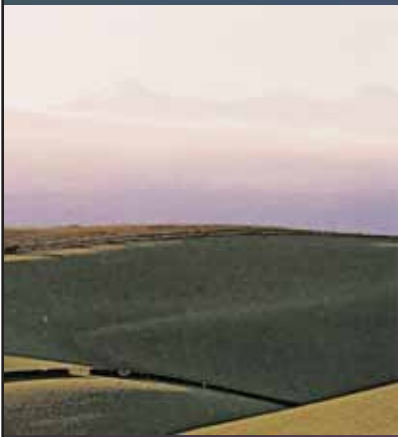
Great ideas in glass



METRO GLASSTECH

It's not a window.

*It's the **magic** that
connects you with
the world around.*



Since mankind discovered how to
construct shelter from the elements,
we have wanted to view nature and
its wonders.

Glass handles the transition perfectly.
Glass today is a hi-tech building material that
transforms space, inspires us and protects us.
Environmentally friendly, glass sits at the cutting
edge of technology and future design.

Here in New Zealand, just one name is all you
need to know in glass: Metro GlasTech.

METRO GLASSTECH

GLASS



CONTENTS: *Index and topics*

*As fashions change and technology advances,
one constant remains essential in glass: quality.*

That's what Metro GlassTech is all about.

Metro GlassTech recognises that any decision affecting your home is not taken lightly. Doors, windows, interiors and other enhancements are a big investment: so you want to deal with people you can trust.

The group was formed with the merger of two well-known New Zealand glass companies, Metropolitan Glass in the North Island and GlassTech in the South Island.

Now the largest glass supplier in New Zealand, Metro GlassTech is the one supplier to meet all your glazing needs.

This one company produces its own GlassTech brand premium quality double glazing with highly innovative features, including thermal insulation management through Low Emissivity glass in conjunction with Metro GlassTech's automatic Argon gas filling.

Metro GlassTech manufactures the Safety+Plus range of safety glass including Tempafloat toughened and Safelite laminate.

Metro GlassTech specialises in interiors including shower glass, mirrors and splashbacks. It produces the Effects range of decorative designer finishes. Metro GlassTech supplies all forms of domestic and commercial glass including glass for furniture.

Metro GlassTech operates from multiple purpose-built premises throughout New Zealand, using the latest technology available worldwide.

With key staff offering decades of experience in the glass industry, the company combines fully comprehensive warranties with a pledge to honour its commitment in full.

There is no such thing as standard glass at Metro GlassTech - every item is manufactured to the customer's specifications.

METRO GLASSTECH

Great ideas in glass



HEAT LOSS / INSULATION: PAGE 10

Reduce the heat loss through your windows to save on energy costs and keep you warm inside

METRO GLASSTECH

GLASSTECH®

DOUBLE GLAZING

COMFORT AND CONDENSATION: PAGE 13

Stay comfortably warm and reduce condensation on your windows

METRO GLASSTECH

GLASSTECH®

DOUBLE GLAZING

HEAT GAIN / SOLAR CONTROL: PAGE 8/9

Control the sun's rays to reduce heat gain with solar control glass and double glazing in your windows

METRO GLASSTECH

GLASSTECH®

DOUBLE GLAZING

GLARE AND COLOUR: PAGE 8/9

Control glare and colour, using solar-control glass in single or double glazing

METRO GLASSTECH

GLASSTECH®

DOUBLE GLAZING

FADING: PAGE 8/9

Reduce the amount of UV light entering your home, protecting those valuable furnishings

METRO GLASSTECH

SAFELITE®

LAMINATED SAFETY GLASS

ACOUSTICS: PAGE 28

Control the way sound enters your home for a quieter, more comfortable environment

METRO GLASSTECH

SOUNDSTOP®

LAMINATED ACOUSTIC GLASS

SAFETY AND SECURITY: PAGE 20

Feel safe and secure using Metro GlassTech's own Safety+Plus brands

METRO GLASSTECH

TEMPAFLOAT®

TOUGHENED SAFETY GLASS

VISUAL EFFECTS: PAGE 30

Use glass to change the aesthetics of your home

METRO GLASSTECH

COLOUR BAK

BACK PAINTED GLASS

PRODUCT OVERVIEW	4
FADING CONTROL	8
DOUBLE GLAZING	10
BLINDS INSIDE DOUBLE GLAZING	16
DOUBLE GLAZING RETRO-FIT	18
SAFETY GLASS	20
SOUND CONTROL	28
DESIGNER EFFECTS	30
MIRRORS	34
BATHROOM GLASS	36
ENTRANCES & SLIDING DOORS	38
BALUSTRADES	40
GLASS FLOORS & TREADS	42
BENDS & CURVES	44
GLASS FURNITURE	46
CARING FOR GLASS	48
GLASS PERFORMANCE	50
HI-TECH PRODUCTION	54
SELECT YOUR GLASS	56

To help make your glass selection, see the Guide on **PAGE 56**

GREAT IDEAS IN GLASS

METRO GLASSTECH

Metro GlassTech maintains a leadership role in the supply of hi-tech double glazing, seeking out the latest methods and technologies from the major nations and bringing them to New Zealand.

Metro GlassTech double glazing is manufactured on sophisticated production lines utilising the latest, hi-tech European machinery incorporating a specialised automatic process to fill the insulating glass units with Argon gas. Computer control ensures quality throughout.

The company is recognised and respected as an innovator in the industry. It was a founding member of IGUMA, the industry's self-regulating and promotion organisation.



One of our innovative products, Blinds Inside puts shades within the panes of double glazing.



Effects finishes

Metro GlassTech has created a range of stylish, modern decorative designer glass finishes which allow your imagination to run wild. The range offers privacy, light transmission and beauty.

Transform glass and make it a perfect component in any residential or commercial interior!



Safety+Plus

Safety+Plus Safety Glass

Metro GlassTech is acknowledged as a leading authority in the manufacture of safety glass products, its technologically-advanced facilities answering safety and security problems of all kinds.

Metro GlassTech's own proprietary brand, Safety+Plus, is produced here in New Zealand on several hi-tech



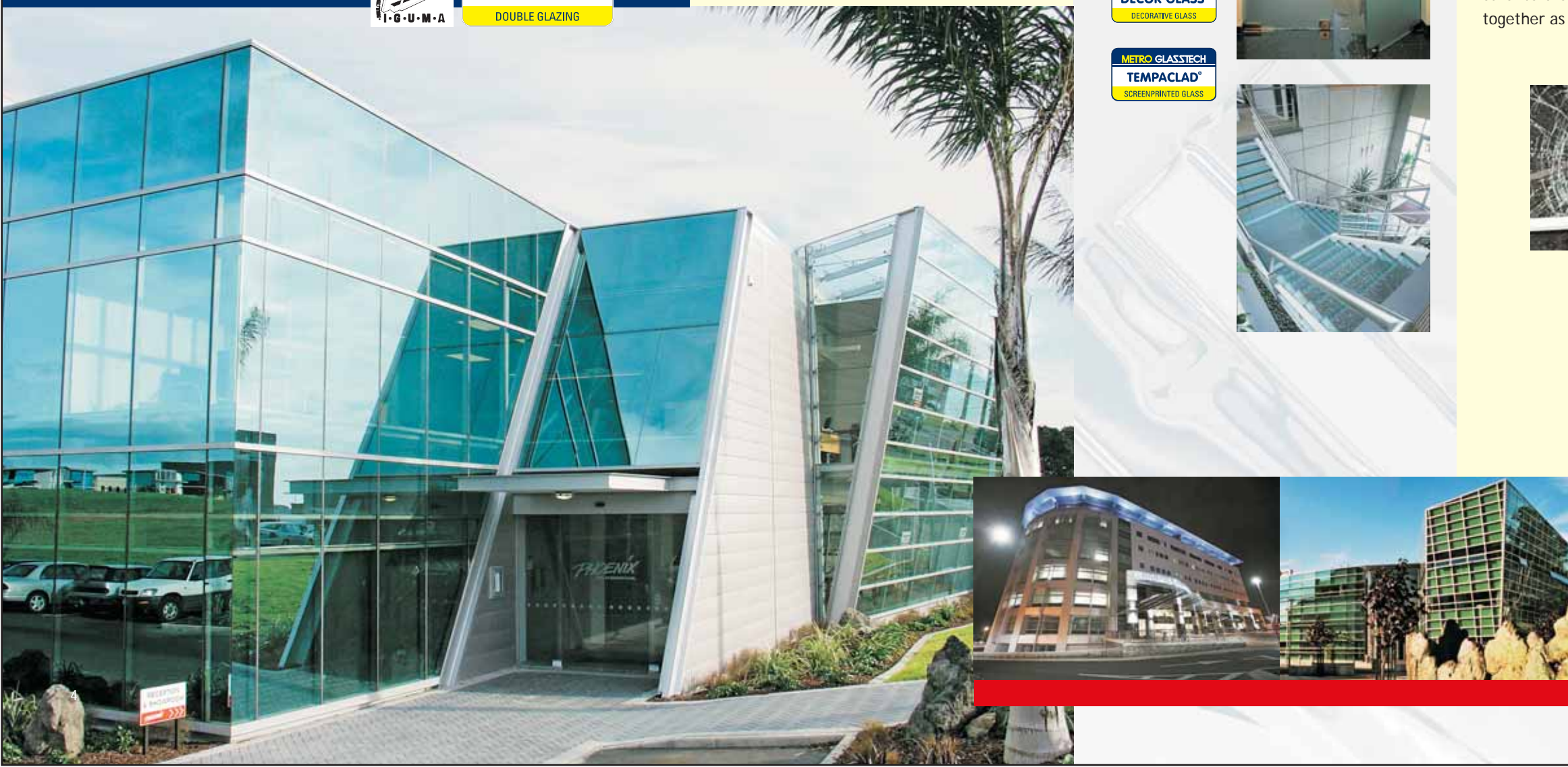
production lines. If broken, its toughened glass called TempaFloat shatters into tiny pieces and Safety+Plus laminated glass called Safelite breaks but remains together as a sheet.



METRO FRAMELESS GLASS SYSTEMS

For home or commercial use, the most innovative designs of world-class MFG fittings put your ideas into practice.

Providing the support for your shower, balustrade and a host of frameless glazing needs, fittings from MFG Systems are available through Metro GlassTech.



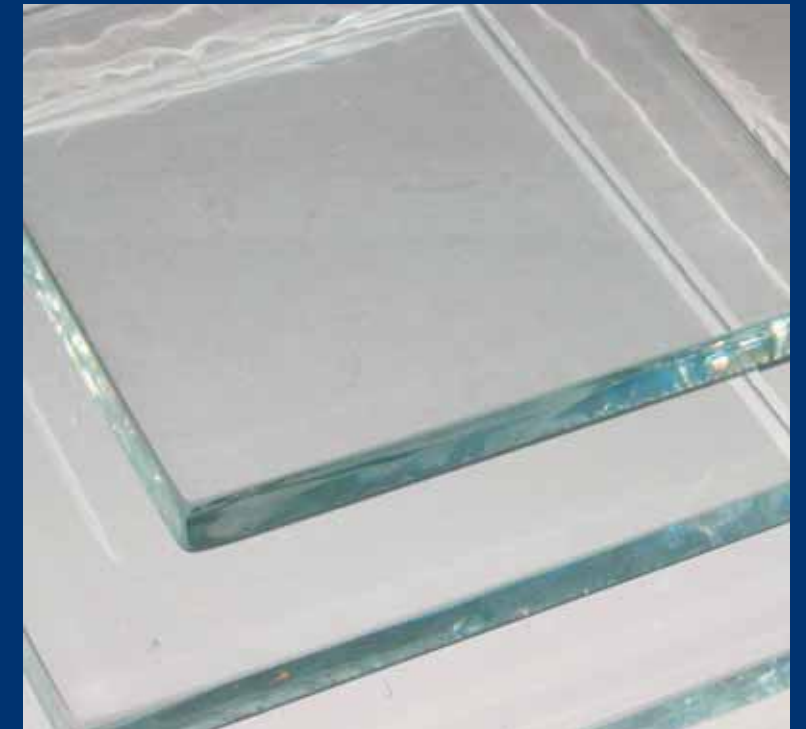
CLEAR GLASS *Time-proven weather protection and durability*



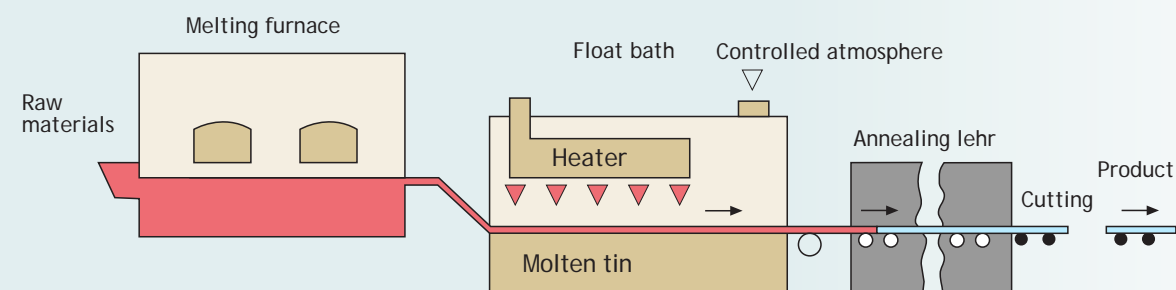
EXTRA CLEAR LOW IRON GLASS

Extra Clear low iron glass contains approximately one quarter of the iron content of standard clear float glass, providing an extra clear glass that is amazingly clear in appearance.

Extra Clear glass is ideal in decorative and furniture applications, showcases and showers. It allows true colour reproduction on glass which is painted or has colour backing.



HOW FLOAT GLASS IS MADE



CLEAR FLOAT GLASS

The float glass process is the most common method of flat glass production in the world. This process involves melting silicate (sand), lime, and soda in a furnace and floating it onto a large bed of molten tin, hence the name float glass.

This mass slowly solidifies over the molten tin as it enters the annealing oven where it travels along rollers under a controlled cooling process until it emerges in one continuous ribbon where it is then cut and further processed to the customer's needs.

As the name suggests, clear float glass is transparent offering high visible light transmittance but it has an inherent green tinge, which is more apparent when viewing the edge of the glass. The green tinge is due to the iron content in the silicate (sand).



SELF-CLEANING GLASS

A new innovation for clear glass is glass that helps clean itself.

Self-cleaning glass has a special coating that reacts with the sun's UV light and uses rain to wash away organic dirt.

It is ideal for those hard-to-clean areas such as roof-lights, sky-lights and conservatories.

Talk to Metro GlassTech first to see if this glass may suit your application.

SOLAR CONTROL GLASS *Don't let the sun get to you*



Fading is the enemy for any homemaker or interior designer: furniture, drapes, carpets, even artworks and photographs come under attack from sunlight, heat and UV radiation.

However, fading can be significantly reduced by the installation of appropriate glass.

UV radiation fades directly while sunlight and infrared act to heat fabric, which accelerates the fading process.

Using the correct glass in a home can be likened to using a good sunscreen on a summer holiday.

The use of tinted and reflective solar control glass reduces the amount of UV, visible light and heat that pass through the glass, thus reducing the rate of fading.

The use of laminated glass can absorb up to 99% of the damaging UV radiation and these can also be tinted to control light and heat transmission.

Combining tinted and reflective glasses with laminated glass types in double glazing can further enhance the properties of your glazing.

KEY POINTS FOR SOLAR CONTROL

The building designer or home owner should consider several key issues when deciding on solar control glass.

- *The aesthetics of the glass in relation to colour, light reflection and transmission and the orientation of the windows.* Tinted glass and reflective glass can offer a multitude of colour options to enhance or transform a building.
- *The performance of the glass to reduce solar heat gain and cooling costs.* Reflective glasses offer superior heat gain performance over tinted glass but this is normally at the expense of reduced natural daylight levels in a building. In general, reflective glass offers lower UV and visible light transmission than tinted glass, especially if used in insulating glass units (double glazing).

- *The performance of the glass to reduce heat loss and heating costs.* This can be improved by using insulating glass units for the best result.
- *The protection of any reflective or coated glass from damage during construction or cleaning* (refer Metro Protect, page 49).

Glass alone will not provide all the answers for the design needs of a building. Orientation, overhangs, shading devices and window size all have a bearing on how well a glass product will perform.

To help make your glass selection, see the Guide on **PAGE 56**

TINTED GLASS

Tinted glass is produced by adding metal oxides during float glass production.

The most common colours are grey, bronze, green and blue, with a range of shades in each colour.

Apart from its function in an aesthetic sense, tinted float glass is primarily designed to reduce solar heat gain, UV and glare inside a building. Tinted glass is also referred to as a heat absorbing glass, in that the glass works by absorbing solar energy.

REFLECTIVE GLASS

Special coatings can be applied to a float glass surface to make it reflective to the sun's short-wave radiation, and/or long-wave radiation from the heat inside or outside the building.

Traditional reflective glass has a mirror-like appearance and reflects and absorbs a major proportion of the sun's direct short-wave solar radiation.

The degree of reflectivity is dependent on the type of coating and the orientation of the glazing. Reflective glass is common in commercial buildings as it provides superior solar control performance to clear or tinted glass products, and thus improves the energy efficiency in the building.

Some modern reflective glasses are lower in reflectivity and have high light transmission so they can be used in housing.

SOLAR LOW E GLASS

Some modern solar control glasses have Solar Low E (low emissivity) coatings that are designed to provide solar control as well as reduce heat loss.

Glass with a Solar Low E coating is specifically designed to reflect long-wave radiation from the glass itself and from the outside and inside environment so reducing solar gain, heat loss and thus energy costs.

Low E glass works most efficiently in insulated glass units, but is also available as laminated glass.

LAMINATED GLASS

Tinted laminated glass uses a tinted interlayer to absorb heat like a tinted float glass. It can also be made with a tinted float glass, reflective glass and Low E glass to improve performance.

FADING REDUCTION

		%UV elimination
Clear Float	3mm	28
	4mm	32
	5mm	35
	6mm	37
	10mm	46
Clear Low E	4mm	45
	6mm	51
Grey Float	5mm	75
	6mm	79
	10mm	89
Bronze Float	5mm	72
	6mm	76
Green Float	5mm	66
	6mm	70
Evergreen	6mm	86
Azurlite	6mm	58
Stopsol SS Grey	6mm	88
Stopsol Bronze	6mm	94
Stopsol SS Dark Blue	6mm	79
Sunergy Azur Blue	6mm	75
Sunergy Green	6mm	84
Sunergy Clear	6mm	54
Panasap Green	6mm	86
Panasap Blue	6mm	77
Graylite	6mm	93
Clear Laminated	6.38mm	99
	10.38mm	99
Grey Laminated	6.38mm	99
Bronze Laminated	6.38mm	99



DOUBLE GLAZING *Insulate for comfort and energy efficiency*



Insulating glass units (IGUs) provide thermal insulation in buildings.

They are used to reduce building heat loss and heat gain and provide comfort for occupants.

Insulating glass units are also called double glazing, double glass units or sealed insulating glass units (SIGU).

ENERGY EFFICIENCY

Traditionally the housing energy efficiency building codes in New Zealand have lacked recognition of the insulation properties of windows and have concentrated on providing minimum thermal resistance values (R Values) for the roof, floor and walls only.

New Standards include glazing and focus on the excessive heat loss through the area of single glazing, which is typically 40 to 45m² on an average house but can be much larger in modern house designs.

Extensive cost benefit analysis has been done to show how the correct insulation of a house can improve the energy efficiency to provide energy savings and improved comfort for both the owner and the country as a whole.

LOW E AND ARGON

The use of Low Emissivity (Low E) glass in IGUs greatly enhances the insulation performance.

The visible light will be slightly reduced if using a clear Low E glass and further reduced if a Solar Low E glass is used. A Solar Low E glass will also reduce the heat gain.

Under certain glazing and lighting conditions, Low E glass can exhibit a purple/blue haze or dappled appearance. This is not a fault but is caused by the surface coating interfering with the light passing through the glass.

Typically the haze is seen early morning or late evening when the sun's light is at a low angle of incidence to the glass or viewing is at acute angles to the glazing.

Low E glass also has a slightly lower light transmission and higher reflectance than clear float and may exhibit a light silver/blue reflectivity from the outside.

The use of Argon Gas inside the IGU will also enhance the insulation performance as Argon is a better insulator than air.

HOW DOUBLE GLAZING WORKS

Clear glass accounts for less than 5% of a window's insulation value, the rest being supplied by the air layers on either side of the glass.

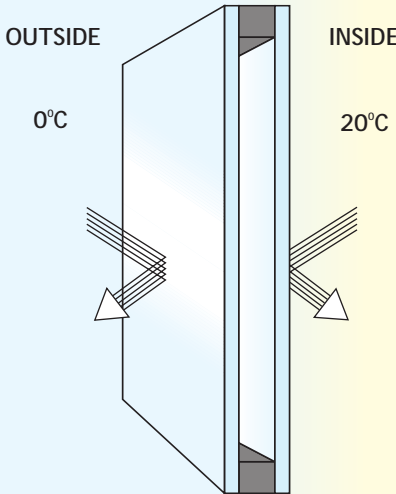
Since the heat flow resistance of still air is much greater than that of glass, a glass unit made of two panes enclosing an air space will have about twice the insulation value of a single pane window (half the heat loss).

This is why double and triple glazed units are called insulating glass units as they provide insulation to the windows of a building, like fibre-glass insulation provides insulation to the wall.

BENEFITS OF DOUBLE GLAZING

- Helps keep heat out and warmth in to save energy costs
- Reduces condensation
- Reduces noise for a calmer, quieter home
- Discourages intruders for security and peace of mind
- Improves your aesthetic enjoyment by providing many different glass choices
- Helps conserve energy and reduce emissions
- Can be retro-fitted into most existing window systems
- Allows more wall area to be glazed
- Reduces the need for expensive, view-blocking drapes
- Enhances resale value

INSULATED GLASS UNITS



GlassTech Double Glazing is designed with comfort in mind. Heat escapes through a single pane, as glass is a poor insulator. GlassTech Double Glazing provides insulation as the layer of air or Argon Gas sealed between the two panes is a very good insulator.

To help make your glass selection, see the Guide on **PAGE 56**



We can create a double glazing solution that's right for you. Different types of glass can be used in GlassTech double glazing - everything from toughened or laminated glass through to tinted or Low E glass.

DOUBLE GLAZING

How double glazing is made



At Metro GlassTech we make double-glazed units to custom sizes and we manufacture to requested specifications. Each GlassTech unit is created through a highly specialised process, computer controlled at every step.

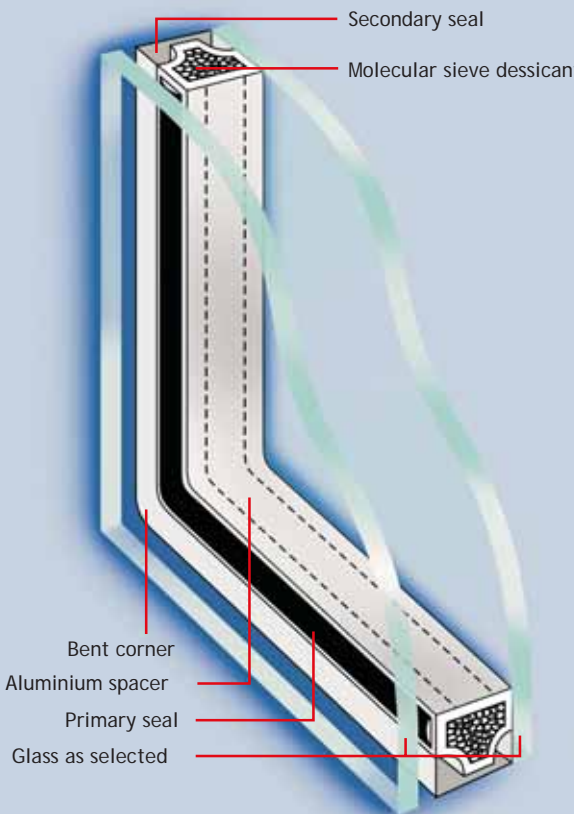
Aluminium spacer, creating the space between the panes of glass, is automatically cut and bent with precision. The spacer is filled with a molecular dessicant designed to act as a drying agent.

GlassTech double glazing is hermetically sealed with a dual compound applied automatically during manufacture. This provides more durability.

Argon gas or air is used for insulating the double-glazed unit, then sealed from escape.

At every step of the production process, GlassTech double glazing is subject to rigorous testing.

Computer-controlled, Metro GlassTech's double glazing lines bond the two sheets to precise tolerances with a special dual seal around an aluminium spacer. They can produce individual IGUs up to 3.5 by 2.5 metres.



Warmer in winter, cooler in summer, with less condensation

As we warm or cool our building's interior we also increase the prospect of condensation, mould and mildew.

Condensation forms when warm air containing moisture meets a cold window surface: if the conditions are right 'dew point' is reached and condensation forms.

As the inner pane of GlassTech double glazing remains substantially warmer than single glazing, condensation is dramatically reduced.

Nothing completely eliminates condensation but GlassTech double glazing comes close. In many cases moisture problems disappear forever, while in other situations just a small amount of condensation forms at the bottom of the glass or frame. This is caused by factors such as room ventilation rather than glazing.

YOUR ASSURANCE OF QUALITY

GlassTech double glazing units have passed testing by BRANZ and comply with the Standards BS5713 and EN1279 Parts 1 and 2 (for confirmation, BRANZ test reports are available).

Metro GlassTech's own GlassTech double glazing meets and exceeds the new Standard to combat heat loss through windows (NZS 4218:2004 Energy Efficiency - Small Building Envelope).



ENVIRONMENTALLY FRIENDLY

Help protect our environment. Installing GlassTech double glazing cuts down energy bills and in a small but valuable way helps reduce air pollution from open fires, saves fossil fuel and reduces global warming.



- Insulating glass units retain much more heat in a room during winter reducing heat loss and saving energy.
- They reduce noise penetration and window condensation and provide warmer zones near windows to increase comfort.
- For summer, with the use of solar control glass, they can reduce heat gain, glare and fading and increase air conditioning efficiency.
- They are harder to break than single glass and the shards normally stay in place after breakage, increasing security.

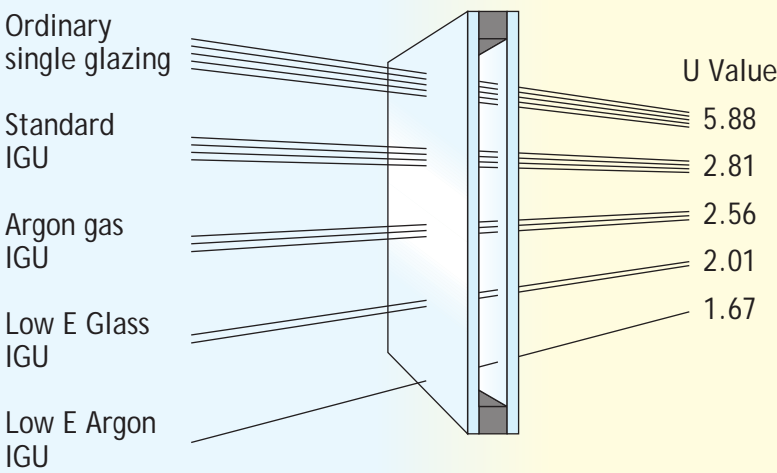
Argon
Double Glazing
It's a gas

DOUBLE GLAZING *Types and insulation*



HEAT LOSS REDUCTION

Insulation Comparision



TYPES OF DOUBLE GLAZING

GLASSTECH DOUBLE GLAZING

Insulating Glass Units filled with air

GLASSTECH ARGON+

Insulating Glass Units filled with Argon Gas

GLASSTECH LOW E+

Insulating Glass Units comprising Low E Glass

GLASSTECH THERMAL+

Insulating Glass Units with the high-tech and innovative Thermix warm edge spacer system, made from stainless steel and high performance engineering plastics

GLASSTECH STRUCTURAL+

Insulating Glass Units with a special silicone secondary seal for exposed edge conditions, structural silicone glazing and point fixed structural glass applications



UNDERSTANDING INSULATION

The means of rating the thermal performance of building products is the "U Value" or "R Value".

The R Value is the value of the thermal resistance of a building element. Its units are $m^2\text{C}/W$ and it is used to compare common building materials. For example R2 Pink Batts indicate that Pink Batts give a wall R Value of 2.0. *The higher the R Value the better the insulation.*

The U Value is a measure of air-to-air heat transmission (loss or gain) due to the thermal conductance of the material and difference of indoor and outdoor temperature. It is used worldwide to compare the insulation of glass products and its units are watts per square metre per degree Celsius ($W/m^2\text{C}$). *The lower the U Value the better the insulation.*

The U Value is the reciprocal of the R Value and either can be calculated from the other, i.e. $U=1/R$ or $R=1/U$.

The U Value is dependent upon climatic conditions, which means that the transmittance of heat through a glazing system changes. Therefore glass transmits heat at varying rates dependent upon the prevailing climatic condition. In comparing glass properties based on a U Value, it is important that the climatic condition used to model all the systems is the same.

Typical U Values for clear single glass and IGU are listed in the table which shows the heat loss is much greater for single glazing compared to any IGU. For example, a 4/12/4 unit (U Value 2.73) has a 54% less heat loss than single 4mm glass (U Value 5.88).

INSULATION COMPARISON - CLEAR GLASS U VALUES

Glass Type	Outer Glass (mm)	Air Space (mm)	Inner Glass (mm)	U Value	R Value	Heat Loss Reduction %
Single Clear	4			5.88	0.17	0%
	6			5.82	0.17	1%
Single Low E	4			3.67	0.27	38%
IGU Clear	4	6	4	3.14	0.32	47%
	4	8	4	2.94	0.34	50%
	4	10	4	2.81	0.36	52%
	4	12	4	2.73	0.37	54%
	4	14	4	2.71	0.37	54%
	4	16	4	2.72	0.37	54%
	4	18	4	2.74	0.37	53%
IGU Argon	5	12	5	2.72	0.37	54%
	6	12	6	2.70	0.37	54%
	4	8	4	2.71	0.37	54%
	4	10	4	2.61	0.38	56%
	4	12	4	2.56	0.39	56%
	4	14	4	2.56	0.39	56%
	4	16	4	2.58	0.39	56%
IGU Low E (Low E #3)	4	18	4	2.59	0.39	56%
	6	12	6	2.54	0.39	57%
	4	6	4	2.53	0.39	57%
	4	8	4	2.21	0.45	62%
	4	10	4	2.01	0.50	66%
	4	12	4	1.90	0.53	68%
	4	14	4	1.90	0.53	68%
IGU Low E (Low E #3 & Argon)	6	12	6	1.89	0.53	68%
	4	8	4	1.83	0.55	69%
	4	10	4	1.67	0.60	72%
	4	12	4	1.62	0.62	72%
	4	14	4	1.64	0.61	72%
	6	12	6	1.61	0.62	73%

**U Value calculated on LBNL W5.2 for NFRC 100-2001 conditions.*

DOUBLE GLAZING *Blinds Inside*



BLINDS INSIDE

EURO ELEGANCE WITHOUT HASSLE

Blinds Inside give you exactly that - shades within two panes of a double glazing unit.

That means no dusting, no wind rattling through the blinds, no little hands or pets getting caught up.

Operated like normal blinds, Blinds Inside can be pulled up or down and the slats tilted to eliminate glare or create privacy.

Because the blinds are contained within a glass unit, they can be used effectively in sloping windows and skylights.

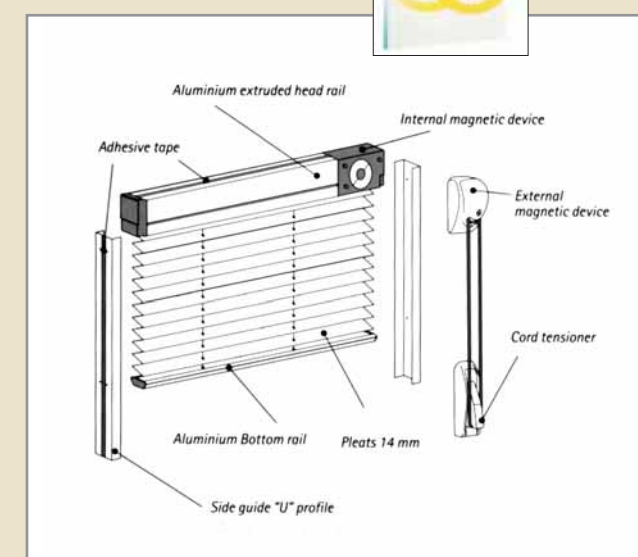
Metro GlassTech offers a choice of modern, thin-slat Venetian blinds or contemporary fabric bi-folds.



Pleated Blind

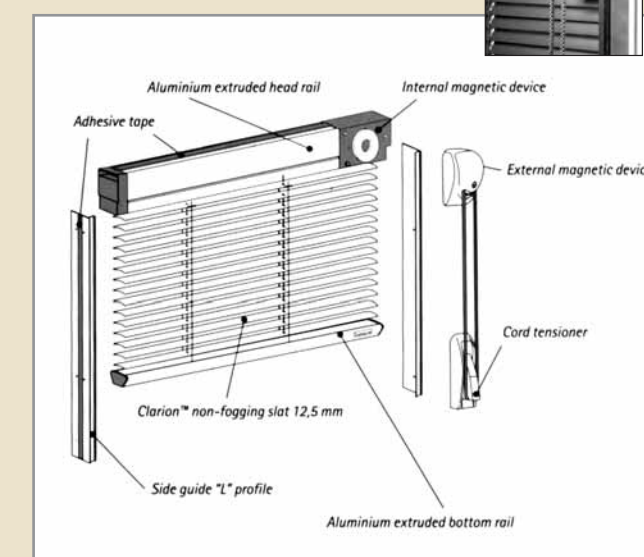
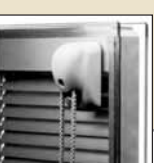


Blinds
Inside
magnet.



Venetian Blind

In a range of five different colours, the 12.5mm slat has been specially developed for this Blinds Inside product.



DOUBLE GLAZING

Double glaze your existing home

Retro-fit double glazing lets you enjoy the warmth and comfort of a new insulated home, by replacing your existing glass.

Metro GlassTech has been providing the Retro-fit service in many different kinds of homes around New Zealand for several years.

If you have aluminium-framed windows, a Retro-fit may be as simple as replacing the existing exterior glass beads with the manufacturer's double-glazing beads.

Where that's not possible, Metro GlassTech uses its own exclusive multi-fit IGU retaining bead and, where necessary, fits new opening sashes.

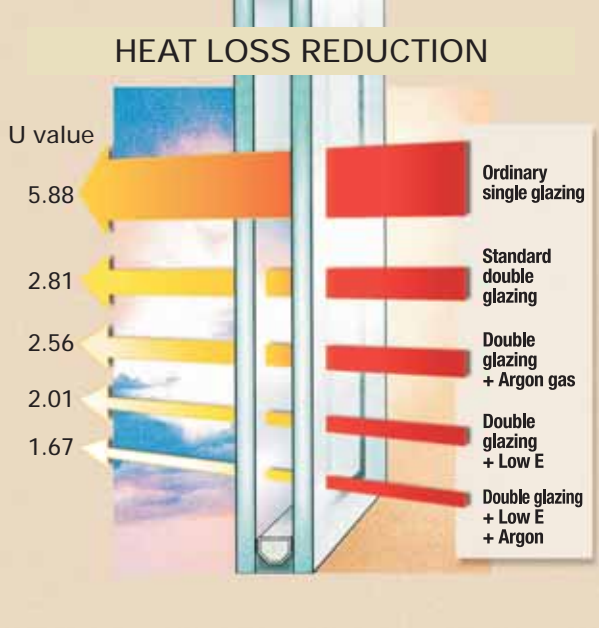
The new beads and sashes are powder-coated or anodised to closely match the colour of your existing window frame.

If you have timber joinery a special Retro-fit adaptor is used or the joinery is altered to accept the IGU.

The work is quick and unobtrusive. Metro GlassTech will measure your windows, the new units will be made at one of our factories and a date set for installation.

Unless you look closely you will probably never notice the change - except the temperature inside your home, the reduction in condensation and your increased comfort.

With a Retro-fit your home is virtually unchanged yet you enjoy all the benefits of double-glazing.



THE NUMBERS HAVE IT

In a typical single-glazed window, heat loss is measured at a U value of 5.88 W/m²C.

With GlassTech double glazing the heat loss is more than halved to 2.81.

Take a double glazed unit with standard glass, fill it with Argon gas and you reduce the value to 2.56.

Now consider the additional benefits. Use Low E glass for double glazing and heat loss drops to 2.01; or combine Argon Gas filling with Low E glass and the heat loss drops to a staggering U value of 1.67.

To help make your glass selection, see the Guide on **PAGE 56**



SAFETY & SECURITY *Keep safe and secure with Safety Glass*



Glass lets in light and warmth; it allows us to admire views and keeps out the wildest weather. When it's Safety+Plus, it also keeps us safe.

Safety+Plus, Metro GlassTech's own proprietary brand, is a name and product range trusted in New Zealand homes and workplaces. This range of toughened and laminated glass products meets all safety requirements.

New Zealand has one of the highest injury rates in the world when it comes to glass-related accidents. A high number of children a week spend time in hospital after smashing into glass of some kind, including doors, partitions and windows.

Many of these accidents can be prevented by using Safety+Plus safety glass in areas of high risk such as shower surrounds, sliding doors and glass furniture.

HOW GLASS BREAKS



TOUGHENED SAFETY GLASS

TempaFloat is thermally Toughened Safety Glass manufactured by Metro GlassTech. Toughened glass is also known as tempered glass.

TempaFloat is produced by cutting and processing sheets of glass which are then loaded into a furnace which has a bed of oscillating rollers.

The glass is heated to a plastic state at around 650°C. Then by computer control the glass is moved into the quench area where it is rapidly cooled by a series of high pressure air nozzles.

This rapid cooling or quenching induces high compression stress in the glass surface while the centre remains in tension.

Although the physical characteristics remain unchanged the additional stresses created within the glass increase its thermal and mechanical strength.

THE BENEFITS OF TEMPAFLOAT

SAFETY

In the unlikely event of TempaFloat breaking, it fractures into small particles significantly reducing the risk of injury.

TempaFloat is a Grade A Safety Glass in accordance with NZS 4223: Part 3 and AS/NZS 2208 "Safety glazing materials in buildings".

STRENGTH

TempaFloat has high mechanical strength and is 4 to 5 times stronger than annealed glass of the same thickness due to the stresses induced during toughening.

It also has high thermal strength when compared with annealed glass and can withstand a temperature differential of 250°C. It is stable in temperatures ranging from -70°C to 300°C.

MECHANICAL FIXING

TempaFloat has high mechanical strength so can be used with mechanical fixings such as patch, spider, hinge, disc, point and countersunk fixing.



METRO GLASSTECH
TEMPAFLOAT®
TOUGHENED SAFETY GLASS

SECURITY

TempaFloat is much harder to break than annealed float or laminated glass; if broken it will not provide security, although often the noise of breakage can be a deterrent.

SOUND

TempaFloat has the same sound control performance as normal annealed glass.

SOLAR CONTROL

TempaFloat has the same solar control and UV elimination as normal annealed glass.

SAFETY & SECURITY *Keep safe with Tempafloat*



TYPICAL TEMPAFLOAT APPLICATIONS

- Doors and side panels
- Internal partitions
- Low-level glazing
- Spandrel panels
- Splashbacks
- Balustrades and fences
- Shower doors and screens
- Frameless glass doors and entries
- Structural glass walls
- Glass canopies
- Furniture
- Squash courts
- Marine windows
- Automotive windows
- Pool fencing

SAFETY GLASS

MARKING

All safety glazing material used in human impact locations is required to be permanently marked to comply with the New Zealand Standard (NZS 4223:Part 3) and the New Zealand Building Code (NZBC Clause F2/AS1).

Toughened Safety Glass cannot be supplied without a stamp unless it is for an application not covered in the NZBC and/or one of the relevant glass standards. An example of this is for furniture where a removable label is normally used or a TFA stamp which is a small stamp on the edge of the glass.

Stamps are normally located at the bottom left-hand corner of the glass when viewed from outside the building. However this may vary due to the glass type as some glasses can be stamped on only one side and thus the stamp may be on the inside.

In some cases the stamp is located in a special position to meet the customer's specification.

SIZE

The maximum-sized sheet of Toughened Safety Glass from our Auckland and Wellington factories is 3900 x 2080 mm; from our Christchurch factory 4500 x 2440 mm.

QUALITY

Some visible marks can be inherent in the glass manufacturing and toughening process and various manufacturers have slightly differing final quality standards.

However, AS/NZS 4667:2000 "Quality requirements for cut to size and processed glass" sets guidelines for acceptable glass quality and methods to view and assess the defects.

This standard also defines thickness tolerances for glass.

STAMP TYPES

Glazing stamp

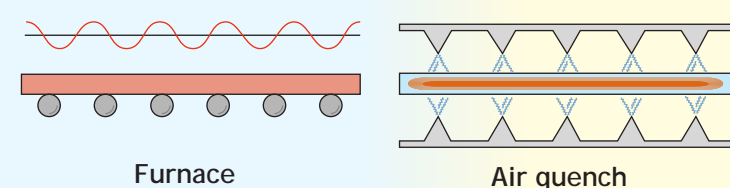


STAMP TYPES

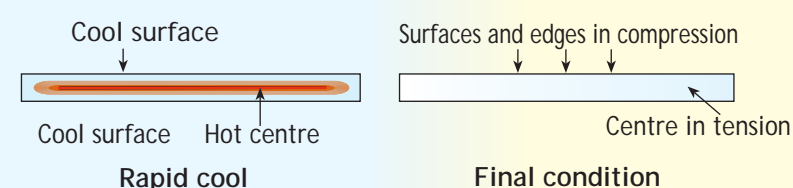
Edge of Glass Stamp TFA



Toughening Process



Glass Condition



SAFETY GLASS *Keep safe and secure with SafeLite*



METRO GLASSTECH
SAFELITE®
LAMINATED SAFETY GLASS

LAMINATED SAFETY GLASS

SafeLite Laminated Safety Glass consists of two or more sheets of glass permanently bonded together by a plastic or resin interlayer.

BENEFITS OF LAMINATED SAFETY GLASS

Safety & Protection

When subjected to human or other impact the bond between the glass and interlayer adheres any broken fragments, keeping the glass intact and resisting penetration.

This important breakage characteristic significantly reduces the likelihood of serious injury, qualifying laminated glass as a Grade A Safety Glass in accordance with NZS 4223: Part 3 and AS/NZ 2208 "Safety glazing materials in buildings".



In addition the glass is unlikely to fall out if used in sloped or overhead glazing applications, providing protection.

Security

Laminated glass offers greater protection for people and property by providing an effective barrier from attack. Although the glass will break if hit with a hammer, brick or similar object, the interlayer can resist penetration, ensuring any attempt to enter a premises will be slow and noisy. In addition the attacked glass will tend to remain in the opening, keeping wind and rain out of the building until it can be replaced at a convenient time. The type of laminated glass required will depend on the level of security sought.

Fading Control

PVB Laminated glass absorbs 99% of the sun's UV radiation while allowing the important visible light to pass through. It therefore helps to protect expensive curtains, furnishings and carpets from fading caused by the damaging effects of short-wave ultra-violet radiation.

Sound Control

Laminated glass is very effective in reducing the transmission of noise through glazing. This is achieved through the sound dampening properties of the interlayer, which will vary with the type and thickness of the glass and interlayer.

Climate Control

Laminated glass can have a tinted interlayer or can be made with tinted or reflective glass to reduce glare and heat gain in a building. It can also be made with Low E glass or can be processed into an IGU to reduce heat loss from the building and thus save on energy costs.

Colour and Light

Laminated glass can be made with a wide range of coloured PVB interlayers to provide special lighting effects. These colours can be combined with tinted and/or printed glass to provide special effects.

Pictures and Images

New techniques allow pictures or digital images to be laminated inside the glass during the laminating process to create special effects. See Image Glass in Effects Section, page 30.

Visible Distortion

Due to the controlled nature of the laminating process, facades glazed with annealed laminated glass reduce the risk of visible distortions sometimes created by the heat treatment processes, providing significantly sharper visual transmission and reflections. These benefits are dependent on the nature of the final processed product.

Clear laminated glass is very similar to clear float glass of the same thickness, and in most cases no colour variation is noticeable. Tinted PVB laminated glass may not match tinted float glass as it is the interlayer that is tinted not the glass and the tints can vary due to a range of PVB suppliers.

The laminate can be made with tinted glass to match tinted float and some products are made in this format as standard.

However, the PVB interlayer can create some polarisation of light in some lighting conditions and this may appear as haze or dappled appearance.

Colour Matching

Laminated glasses with tinted interlayer do not exactly match tinted glass and care is required when colour matching glass types in a building. However the clear glass thickness in laminated glass can be increased to meet design loads without changing the tint colour so matching can be obtained with different thicknesses of glass.



SAFETY GLASS *Keep safe and secure with SafeLite*



Security Glass

SUPER-SAFELITE FEP

Forced Entry Protection (FEP) glass is designed to resist attack by intruders, burglars or other criminals.

It is usually supplied in the form of anti-bandit or multi-laminated glass.

The multiple layers of glass and interlayer give increased levels of penetration resistance compared with monolithic annealed, toughened or standard laminated glass.

The degree of protection required will depend upon the anticipated severity and duration of possible attacks.

For this reason, FEP glass is divided into two broad categories, each with a different level of penetration resistance.



- Anti bandit glass
(smash and grab resistance)
- Intruder resistant glass
(serious attack resistance)



TYPES OF LAMINATED GLASS

SAFELITE PVB is a laminated safety glass made with a Polyvinyl Butyral (PVB) interlayer.

SAFELITE CIP is a "cast in place" laminated safety glass made by pouring a special liquid resin into the cavity between sheets of glass. The resin is cured in the factory by UV light to a hard plastic state, bonding the glass sheets together.

SOUNDSTOP is an acoustic grade CIP laminated safety glass consisting of two sheets of glass with a 1.0mm or 1.5mm acoustic resin interlayer. This product has excellent sound reduction properties due to the elastic nature of the special resin interlayer. Acoustic laminated glass is specifically designed to reduce sound intrusion into buildings.

SUPER-SAFELITE is high-performance safety and security laminated glass, for forced entry protection, bullet resistance, blast resistance, cyclone resistance and prison and suicide cells.



SOUND CONTROL GLASS

Reduce noise for a peaceful environment



Excessive noise is one of the major pollutants of our time

Source	Sound pressure level db (A)	
Jet engine at 30 metres	130	damage to brain
Plane during take-off at 60 metres	120	hearing damage
Noisy workshop	120	
Pneumatic drill at 1 metre	100	
Car horn at 7 metres	100	
Motorway with heavy truck-traffic	80-84	physiological reaction
Big store	80	
City dual carriageway at 15 metres	78-82	
Main street in a city suburb	72-76	
Commercial centre	70-74	
Small street (500 cars per day)	66-70	psychological reaction
Residential area, quiet street	58-62	
Country	35	
Perfect silence (desert/forest/under snow)	18	
Threshold of hearing	0	

A reduction of just 10db will halve the loudness of noise you hear

Today's world is one of noise. Traffic, trains, aircraft, machinery, appliances, television and music systems - sound comes at us from everywhere, much of it unwanted.

Whatever the noise source, the correct selection of glass for the window systems and construction method are crucial for a peaceful environment.

Once the required sound reduction is established for the application a glass type and thickness can be selected. For example, a street noise is 70 dB while a bedroom requires 35dB: therefore 70 - 35 = 35dB of sound reduction required in the windows (and walls).

To help make your glass selection, see the Guide on **PAGE 56**

THICKNESS

Glass generally follows the Mass Law, that is, the thicker the glass, the better the sound insulation properties.

LAMINATED GLASS

While toughened, wired or patterned glass behaves acoustically the same as standard float glass, laminated glass reduces sound due to the vibration-dampening effect of a PVB or CIP interlayer between two panes of glass. Special acoustic grades of laminated glass are available such as SoundStop which is a special acoustic CIP laminated glass consisting of two glass sheets with a layer of acoustic resin.

DOUBLE GLAZING

GlassTech insulating glass units can be used to reduce noise if the glass is of appropriate thickness. In addition laminated glass can be combined in an IGU for very good sound control.

TECHNICALLY SPEAKING



Decibels (dB) are used as a measurement of sound intensity.

Typically the human ear can't detect changes of 1 -2 dB but can pick up a change of 3 dB if there is a time lapse between the sounds and they are of moderate to low intensity. A change of 7 decibels will always be detected and for every 10 decibel increase we perceive the sound to be twice as loud.

It is important to note that even the best sound-reducing glass can't do its job if there are gaps or cracks around a window or door that allows sound through.

Typical indices used to measure sound reduction in buildings:

- STL - The average Sound Transmission Loss is useful for determining the effectiveness of glazed panes to isolate exterior noise (such as traffic) from a building. The higher the STL, the better the glass at reducing sound.
- STC - The Sound Transmission Class is useful for determining the noise reduction offered by internal building elements such as partitions and walls and the effectiveness against sounds such as speech, music, telephones and machines.
- Rw - The Weighted Sound Reduction Index incorporates frequency-modified corrections for the human ear's response. Numerically it is similar to STC but the figures are in dB.
- PSR - The percentage by which the human ear detects a lessening in sound pressure or noise is known as the Perceived Sound Reduction. The percentages are rated relative to the Rw of 3mm glass.

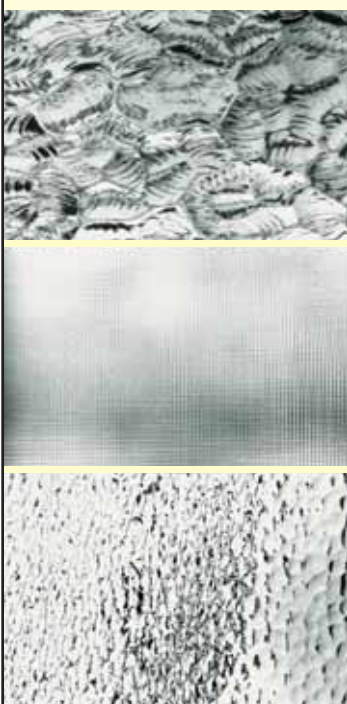


Effects

Bring out the designer in you with visual effects

Metro GlassTech has created a range of stylish, modern decorative designer glass finishes which allow your imagination to run wild. The range offers privacy, light transmission and beauty.

Transform glass and make it a perfect component in any residential or commercial interior.



PATTERNED GLASS

Patterned or obscure glass is manufactured in many different thicknesses with a variety of patterns available.



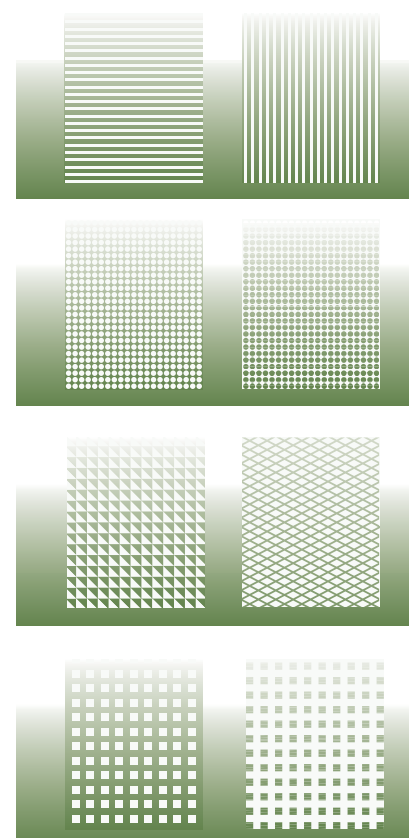
SCREEN PRINTED GLASS

Metro GlassTech manufactures silk-screened ceramic frit glasses for architectural and domestic use.

The process involves screen-printing special ceramic frit paint onto the glass and fusing it onto the surface during the toughening or heat-strengthening process. The result is a tough durable decorative glass.

This decorative process allows the designer flexibility in selecting finishes where colour and pattern design are important for visual impact.

TempaClad is screen-printed with a solid colour. It provides a colour glass that is both decorative and durable.



METRO GLASSTECH

TEMPACLAD®

SCREENPRINTED GLASS

METRO GLASSTECH

TEMPASCREEN®

SCREENPRINTED GLASS

METRO GLASSTECH

TEMPAGRIP®

SLIP RESISTANT GLASS

TempaScreen is screen-printed with a pattern or design. It is both decorative and functional, providing privacy while controlling solar heat gain and glare. It is a transparent product and does not provide total opacity.

TempaGrip is screen-printed with a special slip-resistant frit for floors and treads.

Maximum size

Auckland 3000 x 1600mm

Christchurch 2600 x 1600mm

Colour matching

A full range of colours is possible through our colour matching service. Alternatively select from the Metro Architectural Palette or the Metro Designer Palette ranges.

For the best colour match it is recommended that extra clear low iron glass be used as it does not have the green tinge of clear float glass.



Etchlite

Etchlite brings to the Effects range an acid-etch frost for a wide range of designer uses. Its matt finish provides a satiny, translucent effect that softly filters light, in harmony with current trends towards minimalist pure forms and glass with neutral appearance. Etchlite is described by designers as 'velvet-like' and is available in Clear, Grey, Green or Metallic.



Translucent Laminates

Translucent Laminates are becoming more widely used for decorative and screening purposes. They have an appearance of sandblasted glass or frosted film but are more pure in colour.

These laminates are Grade A Safety Glass and have the added benefit of easier cleaning as the translucent interlayer is contained within the two plies of glass and is permanent.

They are an excellent choice for privacy in doors and bathroom windows, providing good light transmission while the interlayer disperses light evenly to give a pleasant glow effect in lighting the room. These laminates are available in Translucent or Soft White finishes.

Opalite CIP

Opalite is available in a shade range from white to translucent by altering the white resin mixture.

Standard Translucent levels are:

Opalite White (2% white)

Opalite White Translucent (1% white)

Opalite Translucent (0.75% white)

Opalite Light Translucent (0.5% white)



Bring out the designer in you with visual effects

EFFECTS PRODUCTS

ARE IDEAL FOR:

BATHROOMS
SHOWER LININGS & DOORS
SPLASHBACKS
PRIVACY SCREENS
FLOORS AND TREADS
WALL CLADDING
WORK SURFACES
FURNITURE
CANOPIES
TABLE TOPS
CABINETS
CORPORATE INTERIORS



COLOUR BAK

Effects Colour Bak is the bright new look in painted glass. This specialist painted-finish product offers the range of Resene colours.

Its wide range of applications includes kitchen and bathroom splashbacks, shower linings, cupboard doors and more.

IMAGE GLASS

Effects Image Glass combines the latest in digital image technology with the proven performance of laminated safety glass.

High-resolution imagery including pictures can be laminated between the glass and interlayer to provide a stunning range of effects with nearly unlimited applications. The sky isn't the limit - we can superimpose images of the galaxy.



DÉCOR GLASS

Décor glass, the decorative glass range from Metro GlassTech's Effects range, is created using sand blasting, resin or engraving techniques, some combined with colour.

Sandblasted Glass

Sandblasting glass with a combination of high pressure sand and air creates a frosted glass panel, which is permanent. An infinite array of designs can be created, restricted only by your imagination.

Deep Bite Sandblasting

This technique is used to create depth in the glass by blasting deeper into the surface. It can be combined with the standard surface blast to create a completely obscure design for privacy. Very popular in cabinets, it has the ability to create a fresh look for your home.

Décor Colour

By combining traditional sandblast techniques with new technology, extremely intricate designs with depth and colour can be created. Select a standard design from our Decor-Colour Range, which gives the effect of leadlight glass, yet at a fraction of the cost, or we can manufacture a design to your specifications using a wide range of colours.

V Cut Glass

Also known as Crystal Cut or Brilliant Cut Glass, this engraving technique creates a V groove in the surface of the glass to create a characteristic style to door or window panels. Perfectly straight lines create symmetry to a panel which provides subtle elegance.

Décor Mirrors

To enhance the look of your bathroom, consider a design on your mirror, from a simple sandblast border to a Décor Colour or a V Cut. Combine these processes with shaped or bevelled mirrors and you can create a timeless and unique space.



MIRRORS *Mirror your personality*



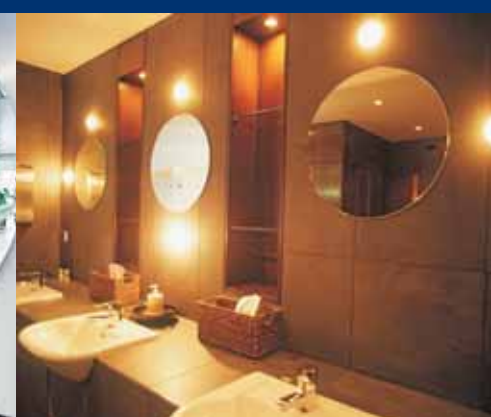
Metro GlassTech mirrors are made from glass of the highest quality treated with a silver backing then paint-coated for durability and resistance to chemicals. They are protected against moisture, corrosion and temperature changes.

Utilising hi-tech specialised machinery, Metro GlassTech can create a variety of mirror designs from polished edges to decorative bevels on straight-edged or shaped pieces of glass. The mirrors can even be V Cut or sandblasted for special effects - you are limited only by your imagination!

Safety vinyl backing is optional on all mirrors and is recommended for high-risk human impact areas. If the mirror is broken the adhesive vinyl will ensure fragments stay together and reduce the risk of injury.

Mist-free mirrors are a fantastic addition to any bathroom. A variety of low-wattage pads are available for fitting to the back of the mirror. These are permanently wired and switched on - no thermostats or transformers are required for normal home use.

Standard mirrors are available in thicknesses from 3mm to 6mm. Vinyl-backed mirrors are normally available in 4mm thickness.



BATHROOMS

The art of creating a bathroom



With a large array of glass and decorative finishing techniques available from Metro GlassTech, your biggest problem when creating a bathroom will be overwhelming choice.

All Metro GlassTech frameless shower enclosures are made of Tempafloat toughened glass from the Safety+Plus range, which can be enhanced with a wide variety of decorative finishing techniques (see Effects, page 30).

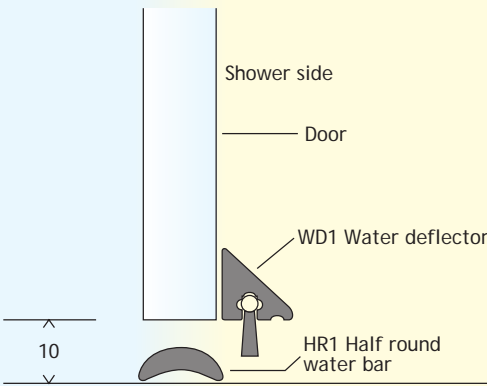
Quality heavyweight frameless showers are custom-made to meet individual design requirements.

Consult with Metro GlassTech in the early stages of bathroom construction as it is important that relevant trades understand the design requirements of a frameless glass shower enclosure.

Metro GlassTech shower hardware is crafted from solid metal for beauty and long life. There's a range of styles and surface finishes to aid bathroom design. Choose from polished chrome, satin chrome, gold and powdercoat finishes.



SHOWER CONSTRUCTION TIPS



1. Ensure there is solid fixing where the glass shower is fixed to the wall.
2. From the outside edge of the shower to the waste there should be a minimum 20mm fall.



Elite Hinge
Clean, modern lines, quality with style



Classic Hinge
Soft lines with bevelled edges



MF 150 Fineline Handle
Ideal for a sharp, clean look



D Handle
For the traditional look



MD250 Delta
Soft flowing lines

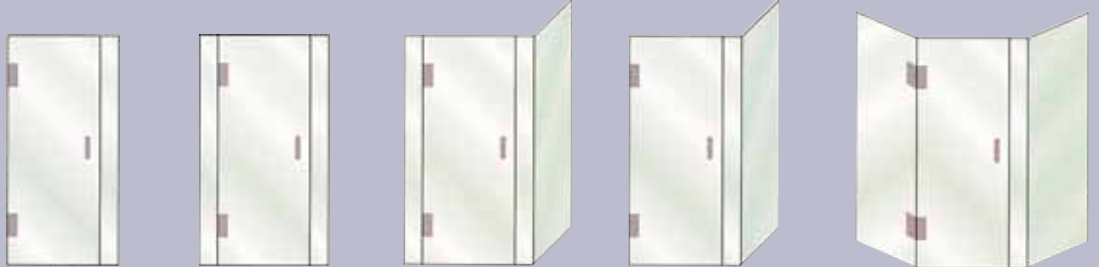


MS Series Handles
Available in lengths from 250mm to 500mm. Works well as an extra towel rail.



MFG SYSTEMS
METRO FRAMELESS GLASS SYSTEMS
Quality components from MFG Systems

SHOWER CABINETS - TYPICAL CONFIGURATIONS



ENTRANCES AND SLIDING DOORS *Make a grand entrance*

Nothing displays like glass, and in recent years this age-old product has been rediscovered for use in modern commercial buildings and high-quality residential dwellings.

Frameless toughened glass entrance doors provide functionality as well as design flexibility to complement architectural design.

The seamless look of frameless glass enhances any environment by adding extra light and a feeling of space.

All glass used in pivoting and sliding frameless door assemblies must be 10,12 or 15mm TempaFloat toughened safety glass to NZS4223.

Commercial frameless entrance.

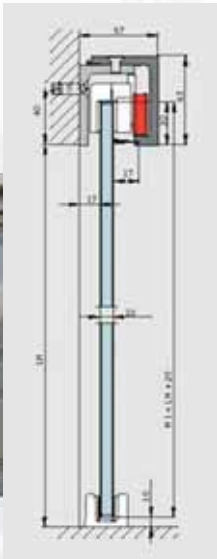
Stabilising fins are used to cope with the loads imposed on the door assembly by the action of the door and by external windloads. Patch fittings enhance the clean lines of any frameless entry.



From design to installation you can rely on Metro GlassTech. We have been installing frameless glass systems for many years.

Service is everything at Metro GlassTech - tap into our expertise, ask our specialists for their suggestions and advice.

Metro GlassTech sources quality fittings from MFG Systems. MFG Systems puts the options in your hands.



Linear 153 Manual Sliding Frameless Door. This is possibly the most interesting sliding door gear available today. Designed for frameless glass panels up to 250kg in weight. The wheels are fitted directly through the glass. This in turn makes for a very appealing look. All the weight is on the floor. This system lends itself for use in domestic or office situations as a room divider and can be used in cavity sliding applications.



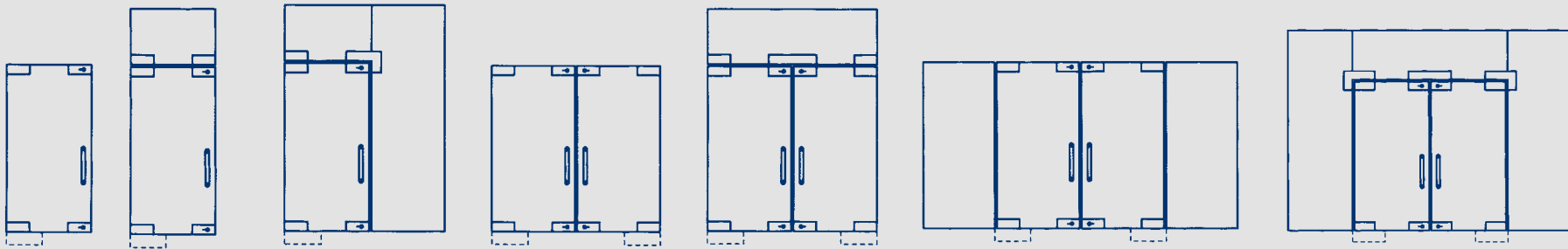
RS Manual Sliding Frameless Door. Gentle, easy action: the carriers run on large nylon wheels with needle bearings giving a quiet and very low-friction ride. Can be ceiling or side-mounted.



Agile manual Sliding Frameless Door with superb track geometry. All of the operational equipment has been integrated out of sight within the track section, despite its tiny 63mm height.



Manet Sliding and Pivoting Frameless Doors. Wherever doors of high quality, unique design and exceptional functionality are required, Manet compact systems for pivot and sliding doors offer the optimum solution.



BALUSTRADES *Add a glass balustrade for practical beauty*



MB50 Disc frameless balustrade fitted to timber deck.

Glass balustrades are increasingly popular in homes, public areas and commercial buildings.

A glass balustrade is a modern and stylish safety barrier, providing strength and safety in conjunction with maximum unobstructed views. Metro GlassTech customises the production of frameless glass balustrades to suit your design and specification.

Metro GlassTech balustrades use TempaFloat Grade A toughened safety glass from the Safety+Plus range. Modern designs use a range of different looks; the specific glass type you choose for your purpose and design can vary.



BA112 with pool gate. A frameless gate, self-closing and self-latching. MFG Systems manufactures high-quality frameless pool hardware.

Structural balustrades require the glass to take handrail loads. They must use toughened safety glass and the loading on the glass is determined by NZS4203 or AS/NZS 1170.

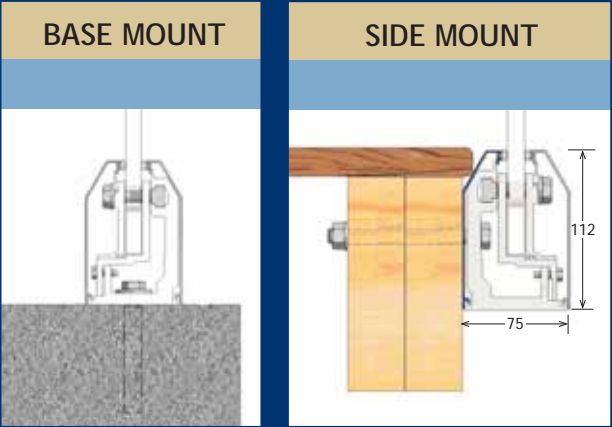
Metro GlassTech sources its quality fittings from MFG Systems.

Contact Metro GlassTech when you are designing your balustrade. We will provide advice on fixing methods of anchors and on relevant building codes with which you must comply.

MB100 with gate. The hinged, frameless pool gate sits within a 100mm diameter 316 grade stainless steel single-row disc frameless balustrade.



MB50 bridge. Disc frameless glass balustrades, 50mm diameter.



BA112. Mechanical fix balustrade is designed to be used with 12 or 15mm toughened safety glass. Suitable for internal or external balustrade and pool fence installations. Fully adjustable for glass alignment and easy re-adjustment if the deck structure moves. All fittings are concealed and the channel can be side fixed or base fixed to timber, concrete and steel.

GLASS FLOORS AND TREADS *Structural beauty*



TempaGrip Slip-Resistant Floor Treatment

In some situations floors and stair treads require slip resistance; TempaGrip can be combined with patterns to produce stunning visual effects on the upper glass surface.

In some designs a sacrificial top toughened glass layer can be provided to protect the more expensive multi-ply laminate below and allow for economic replacement.

TempaGrip is toughened or heat-strengthened glass with a screen-printed slip-resistant surface for glass floors and treads. Its grip can

be applied to the entire surface of a panel in the form of a frost, colour, standard and custom patterns or designs.

It can be used for decorative and functional purposes such as the leading edge of stair treads. Slip-resistant floor surfaces can be applied to the top ply of a glass floor laminate panel, or to a removable 'sacrificial top layer' often used on glass flooring in high traffic areas.

TempaGrip slip-resistant floor surfaces have been tested to meet the requirements of AS/NZS 3661.1:1993.



Design

The design and support conditions of the glass panels are critical for glass selection, as is the glazing method. It is therefore important to talk to Metro GlassTech staff as early as possible if you are considering glass floors and/or treads.



BENDS AND CURVES *In great shape*



Bent and curved glass adds shape and style to your home or building, whether it's a bay window, skylight, balustrade, pool fence, shower screen, partition, door, sidelite or internal cabinet.

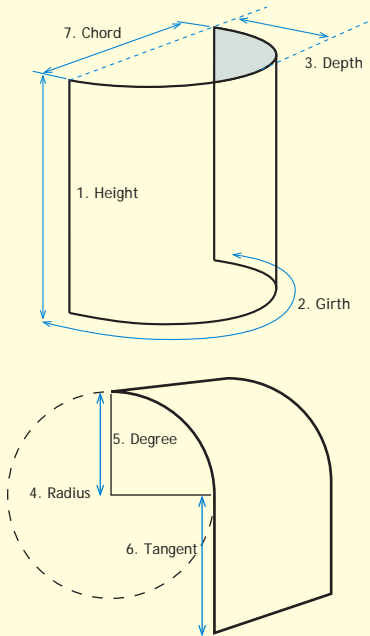
Glass bends are available in normal annealed glass, toughened and laminated safety glass and Insulating Glass Units, although some limits apply to each process.



Terminology

To assist in understanding glass bends, this terminology is used to describe the measurements and characteristics of bent or curved glass.

- 1 Height** *The straight edge length of a bend*
- 2 Girth** *The distance around the circumference of the curve*
- 3 Depth** *The distance between the apex of a bend and a line across the edges of a bend*
- 4 Radius** *A line taken from the centre of a circle to the circumference of the circle*
- 5 Degree** *The size of the segment of a circle expressed in degrees*
- 6 Tangent** *A straight line coming off the arc of a curve*
- 7 Chord** *The straight distance between the edges of the curve.*



GLASS BLOCKS



Beauty and quality you can see

Glass blocks add beauty to any home or office. Offering light without visibility, blocks also reduce noise, keep heat in or out and can offer fire protection. Glass blocks are suitable for all wall claddings. Standard size is 190 x 190 x 80mm. For installation, talk to Metro GlassTech.

Numerous other patterns are available, subject to supply constraints.



Clearview



Cross Ribbed



Light Directing



Flemish Green



Flemish



Flemish Dark Blue

Use glass blocks in: bathrooms, entranceways, door sidelights, stairwells, offices

Glass blocks	
Light transmission	Clear: approx 75% Bronze: approx 60%
Shading coefficient	Clear: 0.56 Bronze: 0.54
Fire rating	1 hour, up to 1.85m x 1.85m (9 x 9 blocks) in steel channel
Maximum panel size	6m x 6m mortar system 2.5m x 2.5m silicone system
Minimum curve radius	1900mm (based on 190mm blocks)
Sound reduction	40-45 dB (STC rating)
U value	3.2

Technically speaking

A special silicone system aids installation, sealing and filling between blocks and joints and on both sides of the wall.

On larger installations, a mortar system is used. For exterior use the blocks are fitted in an aluminium frame, internally no frame is required and a timber stud is normally finished with gib board.

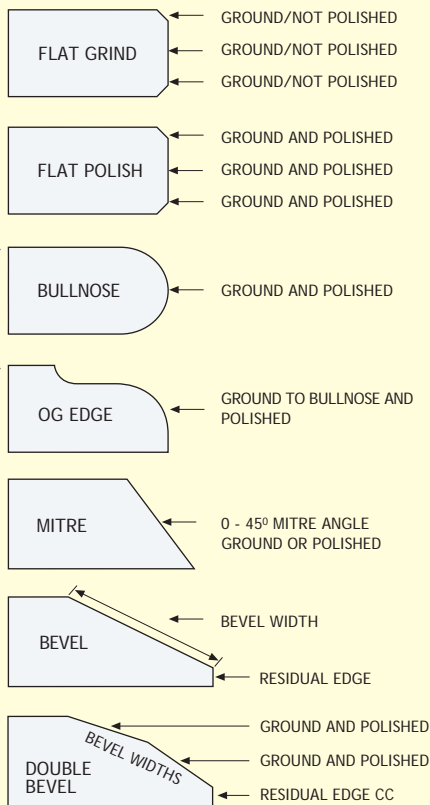
FURNITURE *Comfort and good looks*

Add a sparkle to furniture

Glass, the age-old material, is the new-age look for furniture of all kinds. Modern technologies and finishes give the home, office and store a light and contemporary feel. And with today's special UV glues, Metro GlassTech can create unique furniture designs.

Specify clear glass, or talk to Metro GlassTech about using an Effects decorative finish in your furniture. Special profiles on the edges add the finishing touch.

Edge profiles available



* Some profiles may not be available in all glass thicknesses or in certain parts of New Zealand



TRIFIX

TriFix is an innovative triangular fixing system for joining 8 and 10mm toughened glass panels for cabinets, shelves and desks. The glass fixings can be countersunk or button-head design. Standard finish is satin chrome.

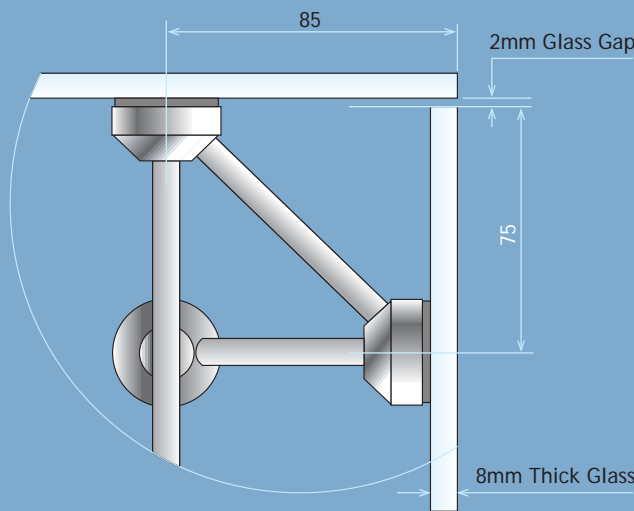


Table top recommendations

Glass not supported over entire area			
Minimum thickness mm			
Area of glass m ²	Toughened glass	Laminated glass	Annealed glass
0 - 0.25	4.0	6.38	10.0
0.25 - 0.50	5.0	6.38	10.0
0.50 - 0.75	6.0	6.38	12.0
0.75 - 1.50	8.0	8.38	15.0
1.50 and above	10.0	10.38	19.0
Glass supported over entire area			
Nominal thickness mm			
Area of glass m ²	Toughened glass	Laminated glass	Annealed glass
0 - 0.5	4.0	6.38	4.0
0.5 - 1.0	4.0	6.38	5.0
1.0 - 1.5	4.0	6.38	6.0
1.50 and above	4.0	6.38	-



HOW TO CARE FOR GLASS

METRO PROTECT *Film-protected glass*

GLASS CLEANING AND MAINTENANCE

The regular washing and drying of glass and window frames affects long term durability, especially during construction. The most important operation is to dry the glass after washing using a clean grit free squeegee, cloth or paper towel and remember 'Wet glass is dirty glass.' Grease marks or glazing compounds and sealants should be removed before washing without damaging surrounding surface finishes.

Window cleaning is best done out of direct sunlight and the following is a guide:
Construction sites: Check weekly for buildup and clean every 1-2 weeks
Industrial sites: Every 1-2 months
Urban areas: Every 3 months
Rural areas: Every 6 months unless crop spraying or sprinkling with bore water.

Then, using a mild, non-abrasive commercial window washing solution, uniformly apply the solution to the glass surfaces with a non-abrasive applicator and follow with a squeegee to remove all of the cleaning solution from the glass surface. Ensure that no metal parts of the cleaning equipment touch the glass surface and that no abrasive particles are trapped between the glass and the cleaning materials. All water and cleaning solution residue should be dried from the window gaskets, sealants and frames.
Scratches and Metal Scrapers
Scratches can occur from hard pointed objects or poor handling, but most often occurs from the careless removal of foreign matter from the glass surface.



Things to do

- DO Clean glass when dirt and residue appear.
- DO Determine if there is a coated surface exposed.
- DO Exercise special care when cleaning coated glass surfaces.
- DO Avoid cleaning tinted and coated glass surfaces in direct sunlight.
- DO Start cleaning at the top of the building and continue to lower levels.
- DO Soak the glass surface with a clean water and soap solution to loosen dirt and debris.
- DO Use a mild non-abrasive commercial cleaner.
- DO Use a squeegee to remove all of the cleaning solution.
- DO Dry all cleaning solution from window gaskets, sealants and frames.
- DO Clean one small window and check to see if procedures have caused any damage.
- DO Be aware of, and follow, the glass suppliers specific cleaning recommendations.
- DO Caution other trades against allowing other materials to contact the glass.

Things not to do

- DO NOT Use scrapers of any size or type for cleaning glass.
- DO NOT Allow dirt and residue to remain on glass for an extended period of time.
- DO NOT Begin cleaning glass without knowing if a coated surface is exposed.
- DO NOT Clean tinted or coated glass in direct sunlight.
- DO NOT Allow water or cleaning residue to remain on the glass or adjacent materials.
- DO NOT Begin cleaning without rinsing excessive dirt or debris.
- DO NOT Use abrasive cleaning solutions, materials or solvents.
- DO NOT Allow metal parts of cleaning equipment to contact the glass.
- DO NOT Trap abrasive particles between the cleaning materials and the glass surface.

NEVER
USE METAL
SCRAPERS

DOUBLE GLAZING

Double glazing may fail if drainage is not able to flow freely at all times. During construction and afterward, ensure drain/weep holes in the joinery are clear and free

from obstruction, regular checks of the drainage system are recommended. Double glazing may fail if solvents come into contact with the edge sealant.

METRO GLASSTECH

PROTECT

ON-SITE GLASS PROTECTION

Other options to protect on-site glazing are the application of plastic masking film or building paper. These are not ideal as they are thin and can tear, or destruct in bad weather conditions. They are also labour-intensive to apply and you can't open or shut the windows.

Protecting the glass using hoarding is also expensive, in some cases is not practicable and it reduces light into the working space.



Metro Protect starts its job even before the glass reaches the site as the full process is carried out at our factory before glazing; the protection is factory-trimmed to suit the glazing system or glazier. Metro Protect can be ordered single or double-sided and to a specified trim distance from the glass edge allowing for easy removal at the completion of the job.

The protective film is four times the thickness of common plastic masking films. It has been designed for commercial site protection, not just transportation protection. It is UV-stable and will not change colour, or gain or lose adhesion over a nine-month period.

The film removes easily and cleanly after nine months with no residue. It is not affected by concrete, plaster or paint and is highly resistant to welding and grinding sparks.

All doors and windows can be opened and closed as normal. There is far less cleaning at the end of the project - simply peel away the film, give a light clean and hand over the job.

Architectural glass products must be properly cleaned during the construction period so visual and aesthetic clarity are maintained. Because glass can be permanently damaged if improperly cleaned, glass producers and fabricators recommend strict compliance with the following procedures.
First, determine whether the glass is clear, tinted or reflective. Surface damage is more noticeable on reflective glass compared with the other glass products. If the reflective coated surface is exposed either on the exterior or interior, special care must be taken when cleaning, as scratches can result in coating removal and a visible change in light transmittance. Cleaning tinted and reflective glass in direct sunlight should be avoided. Cleaning should begin at the top of the building and continue to the lower levels. Commence cleaning by soaking the glass surfaces with clean water and a soap solution to loosen dirt or debris.

Mortar splatter and paint are common offenders and efforts to remove after hardening almost always lead to surface damage. It is essential that the foreign materials are removed before they harden. Better still, if construction work continues after glazing, that the glazed areas are protected by Metro Protect.
One of the common mistakes made by non-glass trades people, including glass cleaning contractors, is the use of razor blades or other metal scrapers on a large portion of the glass surface. Using large blades to scrape a window clean carries considerable risk of causing damage to the glass.
The glass industry, fabricators, distributors and installers neither condones nor recommends any scraping of glass surfaces with metal blades or knives. Such scraping usually permanently damages or scratches the glass surfaces.

PERFORMANCE DATA

SOUND CONTROL		STL	STC	Rw	PSR
Glass Type	Configuration	Average STL (db)	STC Rating	Rw (db)	% Perceived Sound Reduction
4mm Float		25	28	28	10
5mm Float		26	29	29	15
6mm Float		27	31	31	25
8mm Float		29	33	33	35
10mm Float		30	34	34	40
6.38mm PVB Laminated	3mm/0.38mm/3mm	30	33	33	35
8.38mm PVB Laminated	4mm/0.38mm/4mm	33	35	35	45
10.38mm PVB Laminated	5mm/0.38mm/5mm	34	36	36	50
12.38mm PVB Laminated	6mm/0.38mm/6mm	36	38	38	55
7mm Soundstop	3mm/1mm/3mm	34	36	36	50
9mm Soundstop	4mm/1mm/4mm	35	37	37	53
11mm Soundstop	5mm/1mm/5mm	36	38	38	55
13mm Soundstop	8mm/1mm/4mm	38	39	39	57
20mm GlassTech IGU	4mm/12mmAS/4mm	28	30	30	20
22mm GlassTech IGU	5mm/12mmAS/5mm	29	31	31	25
24mm GlassTech IGU	6mm/12mmAS/6mm	30	31	31	25
22.4mm GlassTech IGU	6.38mm/12mmAS/4mm	34	38	38	55
24.4mm GlassTech IGU	6.38mm/12mmAS/6mm	34	38	38	55
25mm GlassTech IGU	7mmSoundstop/12AS/6mm	38	40	40	60

- STL

Sound Transmission Loss

The average Sound Transmission Loss is useful for determining the effectiveness of glazed panels to isolate exterior noise (such as traffic) from a building. It is derived from the average of the measured transmission loss at 18 1/3 octave frequency bands between 100Hz and 5000Hz, or 16 bands from 125 to 4000Hz. The average STL is measured in decibels (dB), the higher the average STL figure, the more effective the glazing will be in reducing sound transmission.
- STC

Sound Transmission Class

The average Sound Transmission Class is useful for determining the noise reduction offered by internal building elements such as partitions and walls. It is a measure that relates the sound reduction performance against sounds which normally occur inside a building (such as voices, telephones, music, etc). STC is a numerical class rating and cannot be compared with the STL. It is derived from a best fit curve comparison of a reference STC curve to the insulation curve. The higher the STC rating, the better the overall sound reduction.
- Rw

Weighted Sound Reduction Index

The Weighted Sound Reduction Index incorporates frequency modified correction for the human ear's response. The Rw is reported in dB and is a composite rating of sound reduction at frequencies from 100 to 5000Hz. Numerically, it is comparable with the STC values but the numbers are in dBA.
- PSR

Perceived Sound Reduction

The percentage by which the human ear detects a lessening in sound pressure or noise is known as the Perceived Sound Reduction. A 10dB reduction in sound pressure level is generally perceived as a halving of the original noise. Sound reduction values are 'weighted' and used to calculate the perceived sound reduction as a ratio relative to the Rw for 3mm clear float.

The dB difference in the Rw value for a glass type when compared with 3mm float is calculated as a perceived sound reduction percentage.

Note: Sound control performance data listed in this publication is derived from the manufacturer's data, acoustic test results, acoustic modelling software or an estimation based on the above methods.

TERMINOLOGY

- VLT

Visible Light Transmission

The percentage of visible light that is transmitted through the glass. The VLT is measured in the 380-780nm wavelength range perpendicular to the surface. The higher the percentage the more daylight. Also known as Tv, Tvis, LT and VT.
- VLR

Visible Light Reflection

The percentage of visible light that is reflected by the glass surface, measured in the 380-780nm wavelength range perpendicular to the surface. The VLR can be given as the reflection from the external surface 1 or internal surface 2. The higher the percentage the more reflection. Also known as LR, VR and Rvis.
- UV

Ultraviolet Elimination

The percentage of ultraviolet radiation eliminated by the glass, measured over the 290-380 nm wavelength range. The higher the percentage the less UV is transmitted. This value is calculated from the percentage transmission of ultraviolet (Tuv). Therefore UV Elimination = 100 - Tuv.
- FRC

Fading Reduction Coefficient

The ratio of fading reduction of a glass type when compared to the fading protection of 3mm clear float. The FRC of 3mm clear float is by definition 1.0 and represents the minimum fading protection offered by standard glazing. The lower the fading reduction coefficient, the better the fading protection offered. The FRC is derived from Damage Weighted Transmission (TdW-K) data which is a measurement of the fading reduction over the whole solar spectrum, not just ultraviolet. It is 'weighted' to include the fact that fading damage occurs from a broad band of solar energy such as infra-red, visible light and ultra-violet.
- SHGC

Solar Heat Gain Coefficient

The measure of the total solar energy transmittance entering a building through the glazing as heat gain. It is the total heat transmission of direct solar transmission and that proportion of absorbed radiation that is re-radiated into the building from the action of heat absorbing glass. The lower the SHGC the better the glass restricts heat energy transmission. The SHGC is also known as the Solar Factor (SF) or g.
- SC

Shading Coefficient

The ratio of the total solar heat gain through a particular glass compared to the total solar heat gain through 3mm clear float glass. (86%) The shading coefficient of 3mm clear float is by definition 1.0 and represents a base glass performance. The lower the shading coefficient the less heat gain and thus more shading is provided by the glass. The shading coefficient is calculated as SC = SHGC / 0.86.
- WERS

Window Efficiency Rating System

The complete WERS rates the performance of windows including frames in various defined New Zealand climate zones. For this catalogue star ratings apply to centre of glass only (WERS cog) to compare glass types and a maximum rating of five stars indicates the best performance possible. The stars have been calculated on the WERS Star Rating Approximator for Glass - Version 2. Ratings in stars and half star values are given for as follows with five stars indicating

the premium performance:

Winter Heating Star rating is a measure of how easy it is to maintain an average New Zealand home at a comfortably warm living temperature through an average climate-year (although principally in winter).

Summer Cooling Star rating is a measure of how easy it is to maintain an average New Zealand home at a comfortably cool living temperature through an average climate-year (although principally in summer).

Fading Star rating is a measure of the amount of damaging solar radiation that is able to enter through the glazing, such that a choice can be made about the degree of protection that you wish to give your furnishings and fabrics. A glazing with five stars will not completely eliminate the fading of all furnishings, but significantly reduces the magnitude of the penetrating solar fading energy.

Condensation Star rating is a measure of the amount of unwanted condensation that will occur on the room side of the glazing of windows in an average New Zealand home, with 5 stars indicating premium performance with a minimum of winter condensation.

Climate Zones

Zone 1 represents the top half of the North Island, including Thames from Greater Auckland north.

Zone 2 represents the rest of the North Island except for the Volcanic Plateau.

Zone 3 represents the South Island and the Volcanic Plateau of the Central North Island.

U Value

The U Value is the measure of air to air heat transfer through glass due to the thermal conductance of the glazing and the difference between indoor and outdoor temperatures. It is expressed as W/m2K (Watts per m2 per 1° Kelvin) or W/ m2 °C (1 Kelvin equals 1°C). The U value is a measure of the rate of heat gain or heat loss through the glazing due to environmental differences between outdoor and indoor air. It is measured at the centre of the glass (cog). The lower the U Value the lower the heat transfer, the better the insulation.

It is also the inverse of the R Value $U=1/R$. U Values are determined using a set of weather conditions established by the National Fenestration Rating Council (NFRC) in America. It is possible to modify these conditions and calculate U Values for specific environmental conditions.

CF Coolness Factor

The Coolness Factor (or luminous efficacy) is the visible light transmission divided by the shading coefficient. $CF = VLT / SC$. It is a useful means of comparing different glass types in terms of the trade-off between light transmission and heat control in selecting glass. Glass types with a coolness factor of 1 transmit as much light as heat, those with a coolness factor lower than 1 transmit more heat than light and those with a coolness factor greater than 1 transmit more light than heat.

R Value (Total Thermal Resistance)

The R Value is the value of the thermal resistance of a building element which is the sum of the surface resistance on each side plus each component of a building element. It is the inverse of the U Value $R=1/U$ and is expressed as m2°C/W.

PERFORMANCE DATA

SINGLE GLASS					VLT	VLR	UV	FRC	★	★	U	R	★	★	★	SHGC	CF	SC	★	★	★
Glass Type		Thickness mm	Visible Light Transmission %	Visible Light Reflectance %	UV Elimination %	Fading Reduction Coefficient	WERS Fading Zone 1,2,3	WERS Condensation Zone 1,2,3	U Value	R Value	WERS Heating Zone 1	WERS Heating Zone 2	WERS Heating Zone 3	Solar Heat Gain Coefficient	Coolness Factor (Luminous Efficacy)	Shading Coefficient	WERS Cooling Zone 1	WERS Cooling Zone 2	WERS Cooling Zone 3		
Clear Float																					
Clear		4	89	8	32	0.96	★	★	5.88	0.17	★★	★★	★★	0.85	0.91	0.98	★	★	★★		
Tinted Float																					
Grey		5	50	5	75	0.45	★★★★	★	5.85	0.17	★	★	★★	0.62	0.70	0.71	★★	★★	★★★★		
Bronze		5	59	6	72	0.48	★★★★	★	5.85	0.17	★	★	★★	0.67	0.76	0.77	★★	★★	★★★★		
Green		5	79	7	66	0.62	★★	★	5.85	0.17	★	★	★★	0.64	1.06	0.74	★★	★★	★★★★		
High Performance Tinted Float																					
Panasap Green		6	70	8	86	0.44	★★★★	★	5.82	0.17	↓	↓	★	0.54	1.12	0.63	★★★★	★★★★	★★★★		
Panasap Dark Blue		6	58	6	77	0.58	★★	★	5.82	0.17	↓	↓	★	0.58	0.87	0.67	★★★★	★★★★	★★★★		
Evergreen		5	73	7	79	0.48	★★★★	★	5.85	0.17	↓	↓	★	0.58	1.09	0.67	★★★★	★★★★	★★★★		
Pyrolytic Low E Reflective																					
Sunergy Clear #2		6	68	10	54	0.67	★★	↓	4.12	0.24	★★	★★	★★	0.59	0.99	0.69	★★★★	★★★★	★★★★		
Sunergy Green #2		6	56	7	84	0.37	★★★★	↓	4.13	0.24	★★	★★	★	0.42	1.16	0.48	★★★★	★★★★	★★★★		
Sunegy Azur Blue #2		6	56	7	75	0.47	★★★★	↓	4.12	0.24	★★	★★	★★	0.44	1.01	0.51	★★★★	★★★★	★★★★		
Clear Laminated																					
Clear		6.38	89	8	99	0.45	★★★★	★	5.72	0.17	★★	★★	★★	0.79	0.97	0.92	★★	★★	★★		
Tinted Laminated																					
Grey		6.38	42	5	99	0.23	★★★★	★	5.72	0.17	★	★	★★	0.61	0.59	0.71	★★	★★	★★		
Bronze		6.38	52	5	99	0.24	★★★★	★	5.72	0.17	★	★	★★	0.64	0.70	0.74	★★	★★	★★		
Green		6.38	72	7	99	0.36	★★★★	★	5.72	0.17	★★	★★	★★	0.72	0.86	0.84	★★	★★	★★		
Tinted Float Laminated																					
Evergreen (3eg / 3eg)		6.38	64	6	99	0.27	★★★★	★	5.77	0.17	★	★	↓	0.50	1.10	0.58	★★★★	★★★★	★★★★		
Translucent Laminated																					
Opalucnt (Arctic Snow)		6.38	57	13	99	0.26	★★★★	★★	5.72	0.17	★	★	★★	0.64	0.77	0.74	★★	★★	★★		
Low E Laminated																					
6.38 Comfort Plus #4		6.38	58	7	99	0.26	★★★★	↓	3.60	0.28	★★	★★	★★	0.52	0.96	0.60	★★★★	★★★★	★★★★		
INSULATING GLASS UNITS					VLT	VLR	UV	FRC	★	★	U	R	★	★	SHGC	CF	SC	★	★	★	
Unit Combination					Visible Light Transmission %	Visible Light Reflectance %	UV Elimination %	Fading Reduction Coefficient	WERS Fading Zone 1 & 2	WERS Condensation Zone 3	U Value	R Value	WERS Heating Zone 1 & 2	WERS Heating Zone 3	Solar Heat Gain Coefficient	Coolness Factor (Luminous Efficacy)	Shading Coefficient	WERS Cooling Zone 1	WERS Cooling Zone 2	WERS Cooling Zone 3	
Outer	Space	Inner	Thick																		
		Air																			
Clear Units																					
4	Clear	12	4	clear	20.0	80	15	48	0.78	★★			★★★★	★★★★	0.74	0.93	0.86	★★	★★	★★	
5	Clear	12	6.4	clear-lam	23.4	79	14	99	0.40	★★★★			★★★★	★★★★	0.71	0.96	0.82	★★	★★	★★	
Argon Gas Units																					
4	Clear	12	4	clear	20.0	80	15	48	0.78	★★			★★★★	★★★★	0.74	0.93	0.86	★★	★★	★★	
Low E Units																					
4	Clear	12	4	Low-E-#3	20.0	74	16	58	0.66	★★			★★★★	★★★★	0.69	0.92	0.81	★★	★★	★★	
6.4	Clear Laminate	12	6	Low-E-#3	24.4	73	16	99	0.35	★★★★			★★★★	★★★★	0.65	0.97	0.75	★★★★	★★★★	★★★★	
Low E and Argon Units																					
4	Clear	12	4	Low-E-#3	20.0	74	17	58	0.66	★★			★★★★	★★★★	0.70	0.91	0.81	★★	★★	★★	
6.4	Clear Laminate	12	4	Low-E-#3	22.4	73	17	99	0.35	★★★★			★★★★	★★★★	0.65	0.97	0.75	★★★★	★★★★	★★★★	
Tinted Float Units																					
5	Grey	12	4	clear	21.0	45	8	79	0.39	★★★★			★★★★	★★★★	0.50	0.77	0.58	★★★★	★★★★	★★★★	
5	Bronze	12	4	clear	21.0	53	9	77	0.42	★★★★			★★★★	★★★★	0.56	0.82	0.64	★★★★	★★★★	★★★★	
5	Green	12	5	clear	22.0	71	14	72	0.54	★★			★★★★	★★★★	0.53	1.16	0.61	★★★★	★★★★	★★★★	
High Performance Tinted Units																					
5	Evergreen	12	4	clear	21.0	65	11	83	0.41	★★★★			★★	★★	0.46	1.21	0.54	★★★★	★★★★	★★★★	
5	Evergreen	6	6.4	clear-lam	17.4	65	11	99	0.25	★★★★			★★	★★	0.46	1.21	0.54	★★★★	★★★★	★★★★	
Tinted Float and Argon Units																					
5	Grey	12	4	clear	21.0	71	12	72	0.54	★★			★★	★★	0.53	1.16	0.61	★★★★	★★★★	★★★★	
5	Bronze	12	4	clear	21.0	53	9	77	0.42	★★★★			★★	★★	0.55	0.82	0.64	★★★★	★★★★	★★★★	
5	Evergreen	12	4	clear	21.0	66	11	82	0.42	★★★★			★★	★★	0.46	1.23	0.53	★★★★	★★★★	★★★★	
Tinted Float and Low E Units																					
5	Grey	12	4	Low-E-#3	21.0	41	8	83	0.34	★★★★			★★	★★	0.45	0.79	0.52	★★★★	★★★★	★★★★	
5	Bronze	12	4	Low-E-#3	21.0	49	10	81	0.36	★★★★			★★★★	★★★★	0.50	0.84	0.58	★★★★	★★★★	★★★★	
5	Evergreen	12	4	Low-E-#3	21.0	60	13	86	0.36	★★★★			★★	★★	0.41	1.26	0.48	★★★★	★★★★	★★★★	
Tinted Float and Argon Low E																					
5	Grey	12	4	Low-E-#3	21.0	41	8	83	0.34	★★★★			★★★★	★★★★	0.44	0.80	0.51	★★★★	★★★★	★★★★	
5	Bronze	12	4	Low-E-#3	21.0	49	10	81	0.36	★★★★			★★★★	★★★★	0.50	0.84	0.58	★★★★	★★★★	★★★★	
5	Evergreen	12	4	Low-E-#3	21.0	60	13	86	0.36	★★★★			★★	★★	0.40	1.28	0.47	★★★★	★★★★	★★★★	

JOIN OUR TRADE



Metro GlassTech is recognised as a leader in glass technology. With key staff offering decades of experience in the glass industry, the company combines fully comprehensive warranties with a pledge to honour its commitment in full.



At Metro GlassTech we don't just cut glass. We utilise the most up-to-date equipment and technology from around the world to create first class products.

Full training and apprenticeships are available in a wide range of areas from glazing to sales or IT.

Talk to us today about the appealing range of career options in the glass industry.



Metro GlassTech operates glass factories throughout New Zealand. All locations have been purpose-built and house the most advanced equipment with the latest technology available worldwide

Metro GlassTech continues to lead in the field of double glazing with the latest hi-tech European equipment computer-controlled for total precision. A specialised automatic process fills the insulating glass units with Argon gas for greater thermal protection.

Metro GlassTech uses the latest generation toughening furnaces to produce TempaFloat safety glass, part of the Safety+Plus range. The company has a total of six furnaces nationwide, producing the largest toughened glass available in New Zealand.



WHAT TO DO NEXT

Just contact Metro GlassTech who will recommend a supplier near you.

Your local glass merchant or window manufacturer will tell you all you want to know about Metro GlassTech products for your home.

DESIGN CHART														
Tick the benefits required for each room in your home or building, then contact Metro GlassTech														
REQUIRED BENEFIT	LOUNGE	FAMILY	DINING	STUDY	CONSERVATORY	KITCHEN	BEDROOM 1	BEDROOM 2	BEDROOM 3	BATHROOM 1	BATHROOM 2	GARAGE	OTHER	PAGE
Reduce Heat Loss														10
Reduce Condensation														13
Reduce Heat Gain														8
Reduce Glare														8
Reduce Fading														8
Reduce Noise														28
Increase Safety														20
Improve the look														30
Clear														
Blue														
Green														
Bronze														
Grey														
Reflective														



Metro GlassTech’s own fleet of delivery trucks covers several million kilometres a year, bringing glass to you.

Our trucks are on the road six days a week, every week of the year, covering the country. At any one time there are tonnes of glass on the move.

METRO GLASSTECH



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