

CARDINAL 
Glass Industries

Laminated Glass

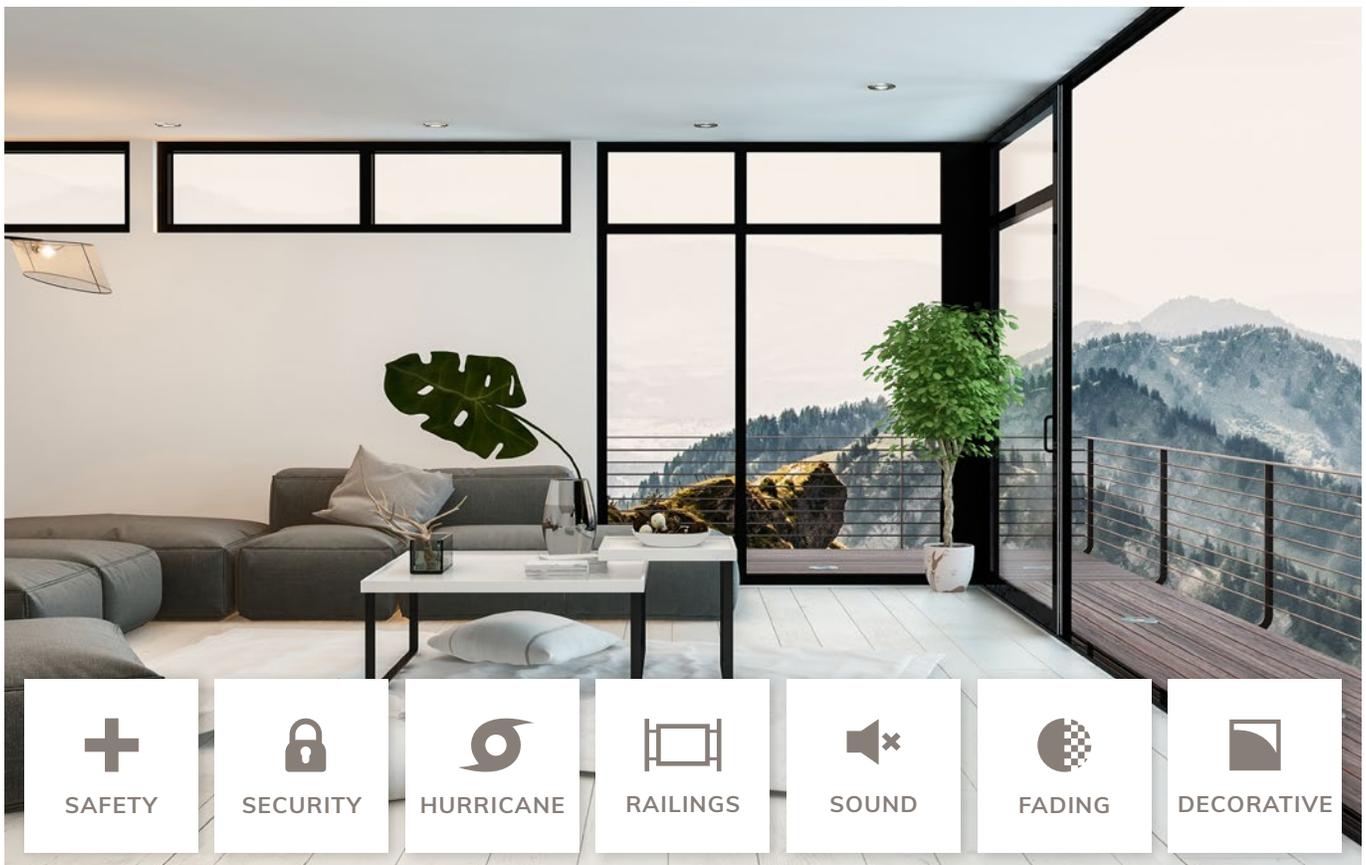
Superior Laminated Glass for Special Applications

Life can be unpredictable. We are all concerned about the safety of our families and homes. Weather can cause havoc. Traffic and other factors make the world a noisier place.

Cardinal's laminated glass provides a level of security, serenity and custom design options that otherwise cannot be realized with ordinary glass.

We deliver unequalled leadership in glass engineering. Our innovation over decades in business has established a level of trust and confidence that window and door manufacturers count on.

More architects and building professionals are turning to Cardinal's laminated glass for windows, doors, railings, and decorative enhancements.



SAFETY



SECURITY



HURRICANE



RAILINGS



SOUND



FADING

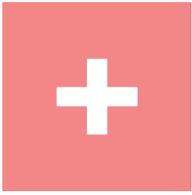


DECORATIVE



Laminated Construction

Laminated glass consists of panes of annealed, heat-strengthened, or tempered glass with one or more invisible interlayers. It is like a blank canvas waiting for your own personal design requirements.



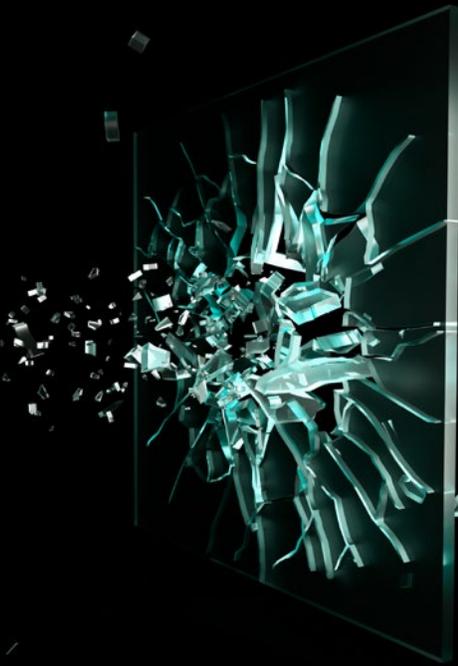
Safe and Sound Inside Your Home

Accidents and injuries involving glass breakage in the home is a part of life, but much can be done to reduce their frequency and severity by using laminated glass.

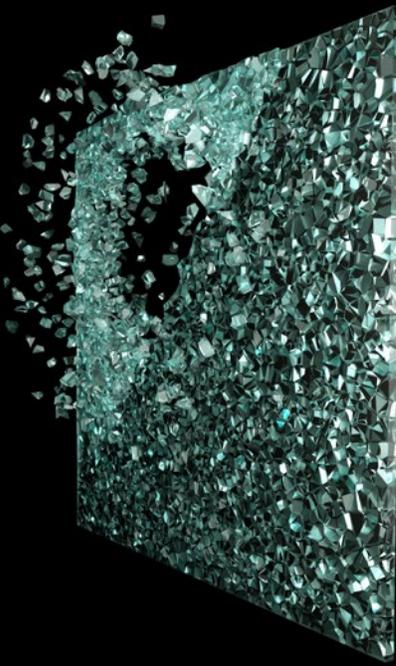
When ordinary annealed glass breaks, the large fragments pose a threat to safety. Tempered glass reduces risk by resisting breakage and breaks into small, benign pieces. Only laminated glass does more: it is the type of safety glazing that remains intact within the window frame.

Cardinal's laminated glass is used for important safety applications, including skylights, conference rooms, window walls and internal partitions. Looking for maximum safety? Laminated glass can also be customized with tempered panes to provide even more protection.





Annealed Glass
Large, dangerous shards



Tempered Glass
Small, benign pieces



Laminated Glass
Remains intact in frame

Safety Glazing Certification Council (SGCC)

Cardinal certifies its laminated safety glass products through the Safety Glazing Certification Council (SGCC).

The SGCC is an independent agency which confirms that safety glass meets the following industry safety standards:

- ANSI Z97.1 Class "A" and CPSC 16CFR 1201 Cat II – laminated glass with 0.030" interlayer and thicker
- ANSI Z97.1 Class "B" and CPSC 16 CFR 1201 Cat I – laminated glass with 0.015" interlayer



Enhanced Protection from Intruders

Specialized security glazing used in Cardinal laminated glass transforms a window or door into a fortified line of defense. Our laminated glass passes tests from international standards organizations, including the ASTM International test for halting forced entry (ASTM F1233) and the burglary resistant guidelines issued by Underwriters Laboratories (UL972).

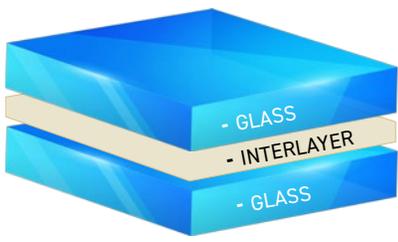
Designed to keep people and property safe for longer, there are multiple glazing options available to suit your specific needs.





BASIC

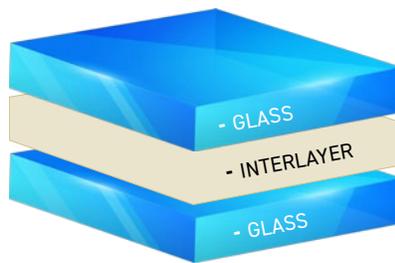
Basic security glazing consists of an interlayer sandwiched between two glass layers. It offers owners the peace of mind that accidental human impact will not shatter the affected area.



Thick interlayer with minimum 0.030 width

ENHANCED

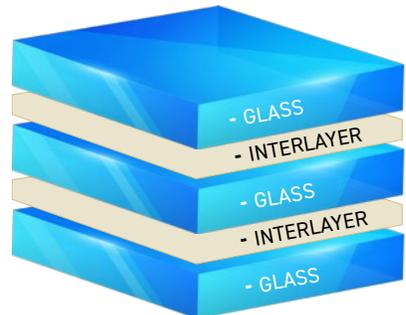
Enhanced security glazing is suitable for areas at risk of burglary. This level of risk prevention will extend deterrence to entry.



Thicker interlayer with minimum 0.060 width

HEAVY DUTY

Heavy-duty forced entry glazing will deter entry from repeated assaults for longer durations of time.



Multiple plies of glass with multiple plies of interlayer.





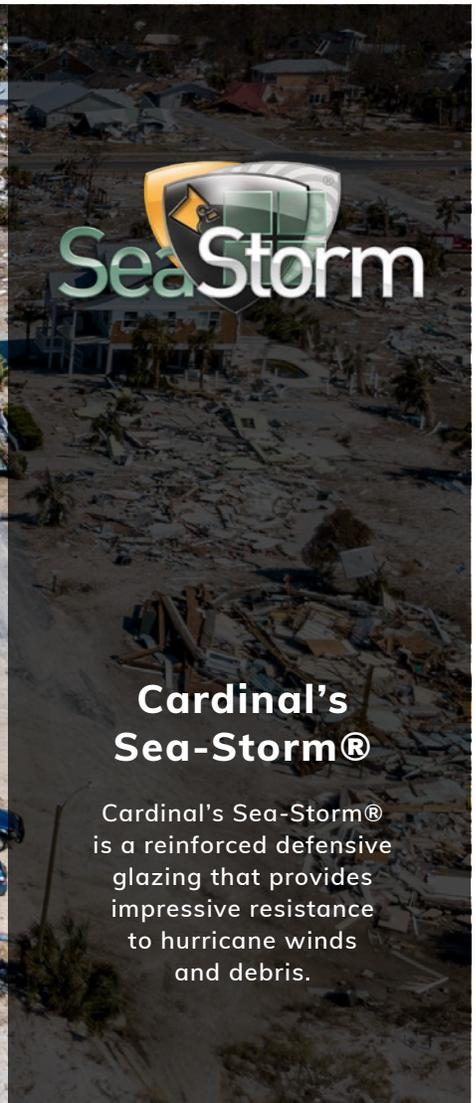
Calm in the Eye of the Storm

For coastal residents, the threat of intense hurricane seasons demands substantial protection.

Damage caused to glass doors and windows from debris during hurricanes is common, and these calamitous events can have an impact on the structural integrity of homes. A breach in a window opening can lead to a monumental pressure increase inside the home, that at worst can lift off the roof and push out the walls.



@Photo Credit JOHNNY MILANO

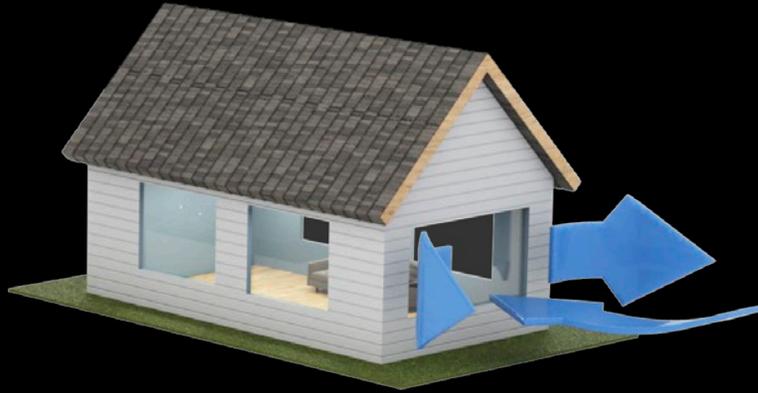


Cardinal's Sea-Storm®

Cardinal's Sea-Storm® is a reinforced defensive glazing that provides impressive resistance to hurricane winds and debris.



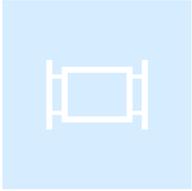
SeaStorm



Sea-Storm impact-rated laminated glass helps preserve the building envelope, minimizing the damage.



When a building is breached through a broken window, wind can enter the building and create a sudden pressure increase that lifts the roof and pushes the walls outward, causing the building to collapse.



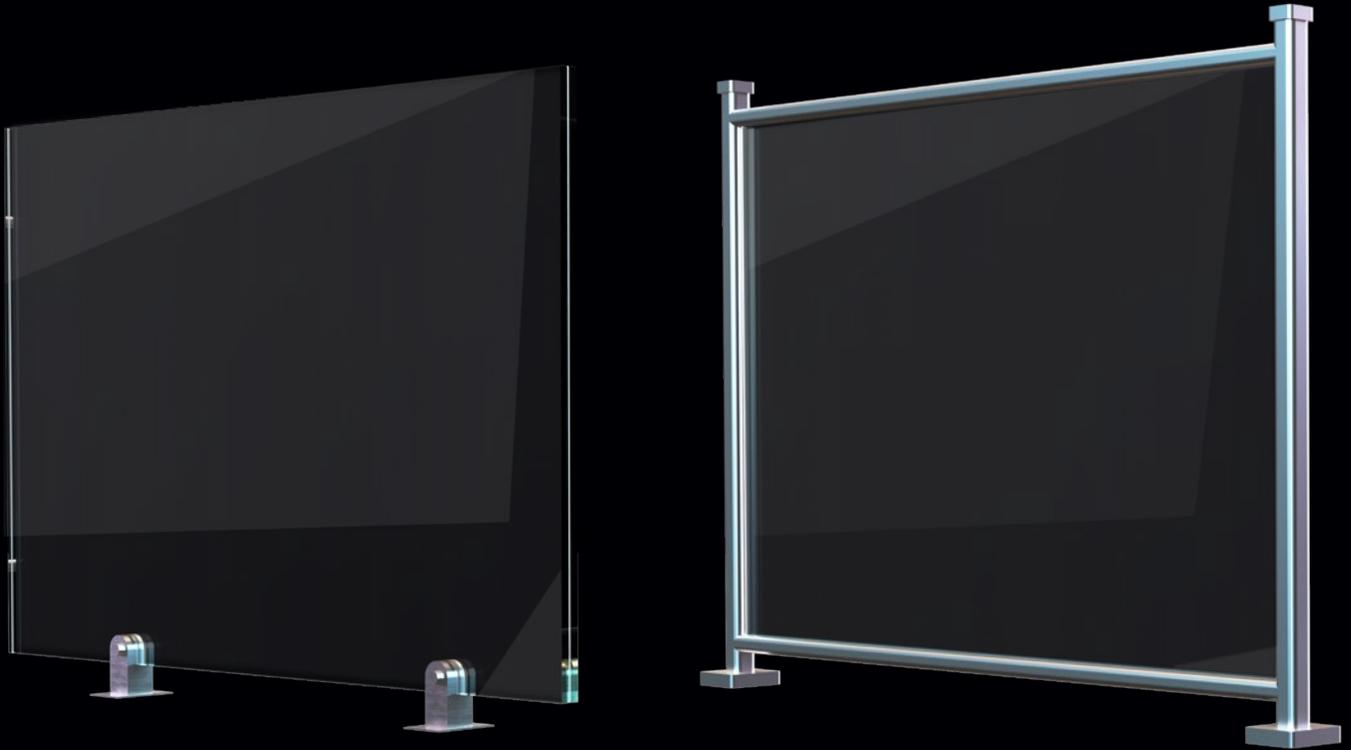
Glass Railings that Clear the View

Cardinal LG provides laminated glass for railings as an attractive and classy option for contemporary buildings. We fabricate the glass for maximum safety and appealing aesthetics.

Since 2015, code requirements from the International Building Code stipulate the use of tempered or heat-strengthened laminated glass in most railing applications.

Cardinal's laminated glass meets this code and is an excellent choice for railings in structural glass applications, exposed edge laminates, floors, and stairs.



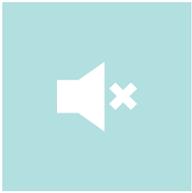


Structural Interlayers

High performance structural interlayers such as SentryGlas® and structural PVBs (e.g., Saflex DG41) are ideal choices for glass railings, balustrades, canopies, or projects where exposed edges are involved. This is due to their increased structural and post-breakage properties over a wide range of temperatures and superior edge stability.

Cardinal LG offers complete production services for your design requirements.

- | | |
|----------------|------------------|
| Polished edges | Mitered corners |
| Hole drilling | Specialty colors |



Experience a New Level of Peace and Quiet

The modern world can be a very a noisy place. The constant din from planes, vehicles and industrial activity can cause major disruption to your everyday life. To protect your home from unwanted noise, windows and glass doors now must play a new role.





1/4" Mono Glass

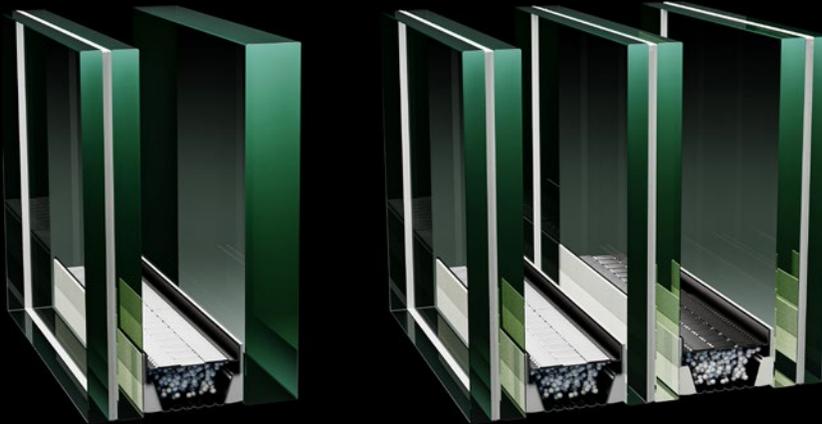
31 **STC**
29 **OITC**

2 Pane 3/4" Annealed IG

31 **STC**
26 **OITC**

7.0 Acoustic PVB

36 **STC**
32 **OITC**



2 Pane 1" IG w/1 7.0 PVB

39 **STC**
31 **OITC**

3 Pane IG w/3 7.0 PVB

44 **STC**
33 **OITC**

The Science of Sound Control

STC (Sound Transmission Class) is widely used to measure sound dampening between frequencies of 125 Hz to 4000 Hz. OITC (Outdoor-Indoor Transmission Class) is a more modern and "real world" test that covers sounds on the lower end of the frequency spectrum, from 80 to 4000 Hz. In both cases, the higher the number, the better the sound deadening effects.

Cardinal provides more options for specific noise reduction situations. Acoustic PVB interlayers with boosted sound reduction performance are available to keep sound in its desired place and make your noise concerns a relic of the past.

Remember: choosing the right glass thickness, interlayer and IG configuration will create the sound performance results you desire.



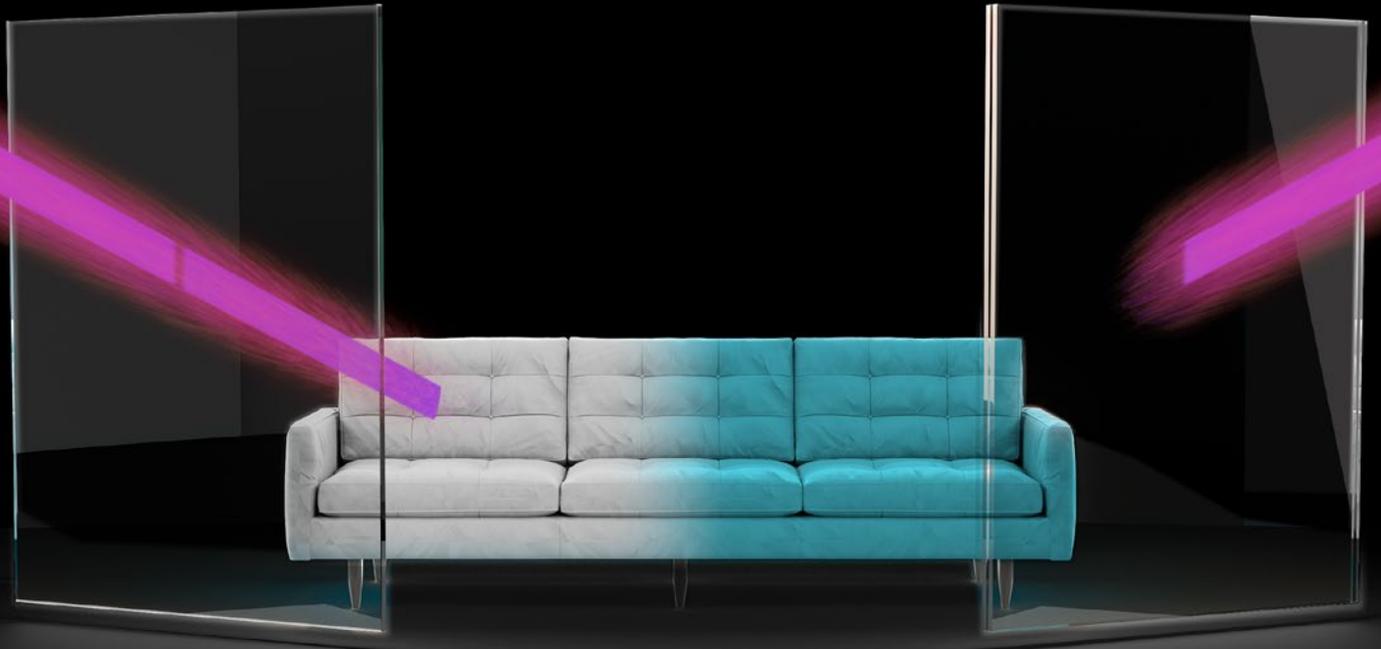
Keep Your Interiors Looking New

The sun is an essential component to living on earth, but it fades carpets, furniture, and other materials inside a home. However, laminated glass cuts most fade-inducing rays and protects your interior long term.

Ultraviolet light has the greatest impact on material fading, and is often measured through Ultraviolet Light Transmittance (UVT) and Damaged Weighted Transmission (Tdw-ISO) tests.

Single pane clear glass, with a UVT of 73%, offers very little protection.





**SINGLE
PANE CLEAR
GLASS**

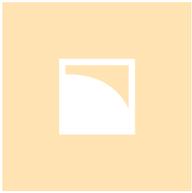
No Fade
Protection

Enhanced UV
Protection

**CARDINAL
LAMINATED
GLASS**

Fade Reduction

Cardinal's laminated glass can be optimized to block out much of the sun's fade damaging rays so that your interior remains unblemished. In addition, laminated glass can incorporate embedded LoE coatings to reduce glare and solar heat gain while still allowing pleasant visible light to illuminate your rooms.

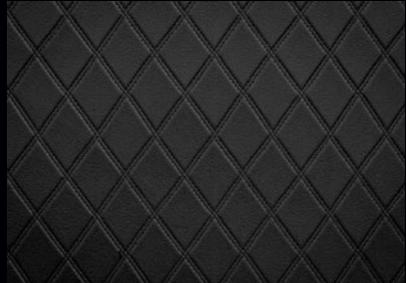
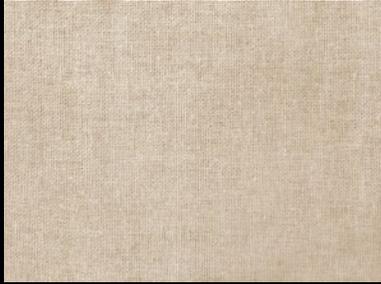


Vision. Transformation. Art.

Whether it be in doors, partitions, railings or walls, Cardinal laminated glass can be produced to make distinctive pieces that transform a room.

The creative possibilities of Cardinal's laminated glass only stop when your ideas do. Thanks to both interlayer and outer-pane design customization, there are thousands of different options that you can choose from to create the exact design you want for your next project.





Customization

Along with being able to add colors, textures, and highlights to laminated glass, the flexibility of the interlayer is also noteworthy. You can add other products such as mirrors, prints, and wood veneers during the design process to create timeless pieces that are exclusive and memorable.

CAPABILITIES

| Ceramic ink printing | Vanceva® colors | Customer-supplied materials

Cardinal LG Advantages

A RELIABLE PARTNER FOR DECADES

Cardinal LG is part of Cardinal Glass Industries, the premier residential glass supplier to America and the world since 1962. You can rely on our continual delivery of the highest performing glass products attainable.

A COMMITMENT TO THE FUTURE

Our Cardinal LG Technology Center R&D facility pushes the envelope to make the near impossible a reality. Our customers are always able to integrate tomorrow's laminated glass innovations in their product designs.





A CONVERGENCE OF INNOVATION

Customers of Cardinal's laminated glass also benefit from the vertically aligned glass products, whether they be LoE™ coatings, custom shapes and sizes, decorative grilles, and insulating glass configurations.

A PROMISE OF QUALITY

Even on large scale, high-capacity orders, quality is never sacrificed. Our online, real-time Intelligent Quality initiative contributes to you receiving defect-free laminated glass on every delivery.



Comprehensive Glass Solutions

Cardinal encompasses a large family of technologies that provide the perfect glass solution for your requirements.





LoE COATED GLASS



Ultimate solar control glass
LoE³-366



High solar gain applications
LoE-180



Glare control glass
LoE³-340
LoE²-240



Maximum U-factor efficiency
LoE-i89



Moderate solar control glass
LoE²-272
LoE²-270



Naturally cleaner glass
Neat+

INSULATING GLASS

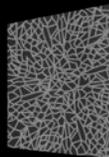


The ultimate warm edge IG
Endur IG



Glass protection through installation
Preserve

OTHER TREATMENTS



Versatile safety glazing
Custom Tempered Glass

Laminated Glass Performance Data - Examples

Product	Vis Trans	Ext Vis Refl	Int Vis Refl	UV Trans	Tdw-ISO	SHGC	U-Factor	U-Summer
6.0mm (Clear-2.7 / .030 PVB / Clear-2.7)	89%	9%	9%	<1%	59%	0.80	1.01	0.91
7.6mm (Clear-2.7 / .090 PVB / Clear-2.7)	88%	10%	10%	<1%	60%	0.78	0.96	0.87
10.0mm (Clear-5 / .030 PVB / Clear-5)	87%	8%	8%	<1%	60%	0.76	0.98	0.89
11.7mm (Clear-5 / .090 PVB / Clear-5)	86%	9%	9%	<1%	56%	0.73	0.94	0.86
11.7mm (Clear-5 / .090 SGP / Clear-5)	86%	9%	9%	<1%	60%	0.74	0.95	0.86
8.6mm (Gray-3 / .090 SGP / Clear-3)	59%	6%	6%	<1%	42%	0.65	0.97	0.88
8.6mm (E366-3 #2 / 0.090 PVB / Clear-3)	61%	13%	13%	<1%	39%	0.34	0.96	0.87
13.6mm (E366-6 #2 / 0.090 PVB / Clear-6)	60%	13%	12%	<1%	39%	0.36	0.94	0.85
11.7mm (E366-5 #2 / .030 GREY .060 PVB / Clear-5)	30%	13%	6%	<1%	19%	0.28	0.94	0.86
11.7mm (E366-5 #2 / .060 GREY (2x030) .030 PVB / Clear-5)	15%	13%	5%	<1%	10%	0.24	0.94	0.86
11.7mm (E366-5 #2/ .090 GREY PVB (3x030) / Clear-5)	7%	13%	5%	<1%	5%	0.22	0.94	0.86
11.7mm (Grey-5 / 0.090 PVB / E366-5 #3)	35%	7%	12%	<1%	23%	0.37	0.95	0.86



For more information, visit us online at cardinalcorp.com/lami