New Planar™ | SentryGlas® Plus System

The world’s leading forces in structural glass systems and laminate interlayers have joined together to create the ultimate in strength, safety, durability and appearance in laminated structural glass – the Planar™ | SentryGlas® Plus System.

Pilkington has been at the forefront of frameless glazing technology for more than 30 years, and Pilkington Planar™ is the most tested and most trusted structural glass system, chosen by architects and engineers for their most challenging applications. Now Pilkington engineers working with DuPont™ scientists have combined their leading edge technologies to develop the Planar™ | SentryGlas® Plus System: the latest advance in frameless glazing.

Applications of the Planar™ | SentryGlas® Plus System are not just confined to complex projects. Significant benefits can be realised on any project in which increased strength or enhanced appearance are considered to be of importance. The versatility of the Planar™ | SentryGlas® Plus System can now match the demands of projects on all levels.

Performance comparison of Pilkington Planar™ using SentryGlas® Plus (SGP) versus PVB interlayers*

- 20% Longer
- 15% Thinner/Lighter
- 66% Stronger

*Based on Test Data

Benefits

**Stronger**
The laminated glass in the Planar™ | SentryGlas® Plus System is substantially stronger than traditional PVB laminated systems. Therefore, while the system still offers the same high levels of performance synonymous with Pilkington Planar™, it can be made with a thinner glass.

**Lighter**
The use of customed-designed Pilkington Planar™ fittings in combination with stronger laminated glass panels results in a Planar™ | SentryGlas® Plus System typically being much lighter than its more conventional PVB counterpart. This can result in longer panels, a reduced number of support fixings and lighter weight support structures reducing their visual impact, as well as providing cost savings.

**More Durable**
SentryGlas® Plus is manufactured by DuPont™; the leader in glass interlayers, and has been subjected to intensive testing to ensure its long term stability.
Maximum Clarity
The SentryGlas® Plus structural interlayer is significantly clearer than traditional interlayers. When used with Pilkington Optiwhite™ exceptional clarity is achieved, even in a laminated glass.

Safer
Tests have proven that the Planar™ | SentryGlas® Plus System has residual strength, even with both glass components broken (see Graph 1, page 6). This brings greater peace of mind in locations subject to typhoons or hurricanes, and makes it possible to specify laminated glass for canopies and skylights which can be accessed for maintenance.†

The Planar™ | SentryGlas® Plus System can also be designed to withstand a variety of bomb blast performance requirements.
† Subject to local regulations and safe working practices

More Applications
The Planar™ | SentryGlas® Plus System can be supplied using the revolutionary Pilkington Planar™ Integral System, allowing a much wider choice of glass than traditional structural laminates.

Installation
Installed only by a worldwide network of trained and accredited contractors, the Planar™ | SentryGlas® Plus System provides the user and specifier with absolute peace of mind throughout the construction process.

12 year warranty
The Planar™ | SentryGlas® Plus System is subject to a design and engineering check by Pilkington engineers, and carries the full Pilkington Planar™ 12 year warranty.

The William Jefferson Clinton Presidential Centre & Library, Little Rock, USA
Planar™ | SentryGlas® Plus System in action

Project: Yorkdale Shopping Centre
Location: Toronto, Canada
Architect: MMC International
Specification: Planar™ | SentryGlas® Plus System
Insulating Glass Units comprising:
10mm Pilkington Suncool™ HP Clear 65/41 T Plus outer glass
16mm Gas Filled Cavity (argon)
17.52mm Inner laminated glass comprising of:
10mm Pilkington Optifloat™ T Plus
1.52 SentryGlas® Plus Structural Interlayer
6mm Pilkington Optifloat™ T Plus
with Silk Screen Printing.
Scope: The addition of a 60 foot high, 300 foot long barrel-vaulted atrium to the centre originally built in 1964.

The structural glass roof uses open space and natural light to create the streetscape feeling that the architects wanted.

Project: Mission Valley East LRT – Alvarado Medical Centre
Location: San Diego, CA, USA
Architect: Parsons Brinkerhoff, Los Angeles, CA, USA
Specification: Planar™ | SentryGlas® Plus System
10mm Pilkington Optifloat™ Green T Plus
1.52mm SentryGlas® Plus Structural Interlayer
6mm Pilkington Optifloat™ T Plus
with Pilkington Planar™ seismic 905 fittings.
Scope: 6 canopies totalling 2500sq.ft. Steel tube structure with gusset plates to support the seismic fittings.
Project: The William Jefferson Clinton Presidential Centre & Library
Location: Little Rock, AR, USA
Architect: Polshek Partnership Architects, LLP
Specification: Planar™ | SentryGlas® Plus System
10mm Pilkington Optiwhite™ T Plus
SentryGlas® Plus Structural Interlayer
10mm Pilkington Optiwhite™ T Plus.
Scope: Approximately 13,000 sq.ft of Pilkington Planar™ laminated glass, incorporating Pilkington Optiwhite™ low-iron glass.
The project underwent a severe testing regime, surviving loading to 160PSF (8kPa).

Unless otherwise stated, all Pilkington Planar™ was supplied by W&W Glass Systems Inc.
New York, USA

Project: Hong Kong Police Headquarters
Location: Arsenal Street, Wanchai, Hong Kong
Architect: Hong Kong Architectural Services Department
Specification: Planar™ | SentryGlas® Plus System
8mm Pilkington Optifloat™ T Plus
1.52mm SentryGlas® Plus Structural Interlayer
19mm Pilkington Optifloat™ T Plus with Pilkington Planar™ Integral fittings
Glazing Contractor: S M Engineering Ltd.
Hong Kong
Scope: Over 12,000 sq.ft of the Planar™ | SentryGlas® Plus System is used in this installation.
Designed to give maximum protection against typhoon wind loads (4kPa or 200mph) and other threats
What makes the Planar™ | SentryGlas® Plus System so efficient?

Graph 1: Residual Strength - even with both glass components broken

Creep Loading: Post-Glass Breakage

- Test laminates, horizontal plates, centre loading (sand bags), 4-sided support.
- Laminates fractured using ball drop.
- Load to 330kg, measure deflection over time.
- Failure defined by pullout or damage localisation and tearing.

Graph 2: Load Shared between both panels of the laminate

Relative Strength (Bending)

- SentryGlas® Plus laminates show superior strength properties.
- Up to 65% stronger than EVA laminates.
- Good opportunities to reduce glass thickness, particularly for thicker glass.

Glass

Pilkington toughened glass is manufactured to exceedingly high quality specifications, including increased toughening stress while maintaining very low distortion – often a contributing factor to problems associated with laminated glass.

Load sharing

Specially developed Pilkington Planar™ fittings combined with the much higher modulus of the structural interlayer (compared with traditional interlayers – see Graph 2), allows the Planar™ | SentryGlas® Plus System to share applied loads between both glass panels of the laminate. The fittings are designed to interlock with the interlayer to develop maximum strength and structural efficiency, giving a significant increase in load bearing capacity while at the same time reducing the thickness required.

Low deflection

The Planar™ | SentryGlas® Plus System fully utilises the increased stiffness of the SentryGlas® Plus interlayer (100 times that of PVB) to reduce deflections under wind and dead loads – often a limiting factor when designing structural glazing installations.

High & low temperatures

SentryGlas® Plus has a higher Glass Transition temperature (Tg) than other interlayers which means enhanced mechanical properties can be utilised over a much greater range of temperatures. Pilkington engineers allow for temperature variations and all load combinations when designing Planar™ | SentryGlas® Plus System installations, using techniques developed by DuPont™ and Pilkington as well as international standards.

Strain Gauge Testing around Pilkington Planar™ countersunk hole.

Analysis of Planar™ | SentryGlas® Plus System using Finite Element Analysis.
**Durability**

SentryGlas® Plus is a DuPont™ engineered polymer containing no plasticisers, resulting in unrivalled edge stability. Edge Stability Numbers (ESN) with SentryGlas® Plus interlayers remain zero at all known installations, including seven year test panels exposed to severe Florida heat and humidity (see Table 1). Pilkington and DuPont™ together with the sealant suppliers have also tested for compatibility and approved a wide range of weather seals for use in the Planar™ | SentryGlas® Plus System.

**Table 1: DuPont™ SentryGlas® Plus Edge Stability Test Data after seven years’ exposure**

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<th>Sample ID</th>
<th>Laminate Perimeter (mm)</th>
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Edge Stability Numbers (ESN) with SentryGlas® Plus interlayers remain zero at all known installations.

**Design**

To gain maximum benefit from the enhanced properties of the toughened laminated glass, Pilkington engineers have developed customised fittings incorporating advanced Engineering Plastic technology, and connections back to structure. These have had to be upgraded from standard Pilkington Planar™ fittings to provide a number of functions including developing maximum strength while eliminating compression in the interlayer – which can reduce load bearing capacity and durability. The fittings are also designed to retain the laminated panel in position, even in the event of glass breakage.

**Planar™ | SentryGlas® Plus System specification**

**Planar™ | SentryGlas® Plus System glass construction**

<table>
<thead>
<tr>
<th>Pane 1</th>
<th>10, 12, 15 or 19mm Pilkington T glass Plus (Toughened and Heat Soaked)</th>
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<td>1.52 or 2.28mm SentryGlas® Plus Structural Interlayer</td>
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<tr>
<td>Pane 2</td>
<td>6, 8, 10, 12, 15 or 19mm Pilkington T glass Plus (Toughened and Heat Soaked)</td>
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</table>

**Glass size – rectangles**

Maximum: 2000 x 3500mm ±0 +4mm (larger sizes available Autumn 2005)

Minimum: 360 x 900mm ±0 +4mm

Aspect ratio: 10:1 Maximum

The Planar™ | SentryGlas® Plus System is also available using the Pilkington Planar™ Integral design, and in Pilkington Planar™ Insulating Glass Units (IGUs).

Standard and custom screen print patterns and tinted glass range available on request.

Each project is subject to design, engineering and feasibility checks once full and final details/drawings are supplied. For initial advice and enquiries such as larger size availability, please contact your local approved installer.