



**Pilkington Planar™**

The world's leading structural glass systems.



**PILKINGTON**

## Pilkington Structural Glass Systems. Unrivalled performance for over 40 years.

Pilkington **Planar**™, the world's leading structural glass system has evolved from the original patch plate system pioneered by Pilkington over 40 years ago.

With a proven track record in the most demanding applications, the Pilkington **Planar**™ system lets architects create a complete glass envelope for buildings, with façades on any plane. So you can build highly attractive working environments with more light and a greater feeling of space.

Support structures, located internally or externally, can be as subtle or as dominant as you wish. They are made with glass mullions, a conventional steel construction, or the revolutionary Pilkington **Planar**™ Tension Structure design.



*Bristol Exploratory, Bristol, UK.*



*Bullring, Birmingham, UK.*

Quality is assured by the exclusive use of Pilkington glass, with fabrication and design carried out in an ISO 9000 certified manufacturing facility in St Helens, UK. The only one in the world, in fact, that is dedicated solely to structural glass systems.

Further reassurance comes from our heritage. The world leader in glass manufacture since 1826, Pilkington supports constant innovation with sophisticated research and the most rigorous product testing programmes.



*Glass Footbridge, Oldham, UK.*

## Latest developments

Pilkington continues to lead the way with new developments.

In keeping with our policy of constant improvement, the following four developments are now part of the Pilkington **Planar™** range:

### Pilkington Planar™ Triple

The world's first triple glazed frameless system, offering improved thermal insulation, design flexibility and multiple glass combinations for better solar performance or noise control.

- U values of  $0.8\text{W/m}^2\text{K}$  achievable
- Acoustic performance of  $R_w > 42\text{dB}$  achievable
- Maximized load capacity for larger design modules
- Building transparency increased by larger vision areas

### Pilkington Planar™ Integral

By using a bolt fixing incorporated into the glass rather than an exterior fastener, this revolutionary method of securing panels allows the use of a greater variety of glass types.

- No holes in external glass surface
- Flush exterior for easier maintenance
- Wider choice of glass improves design flexibility

### Pilkington Planar™ Heavy Duty

Constant improvement in Pilkington **Planar™** bolt fittings has increased capacity to such an extent, larger and heavier insulated glass units can now be easily accommodated.

- Larger modules available for units, even over 700kg
- Increased load capacity allows high wind load applications

*Madame Tussauds Wax Museum,  
New York City, NY.*

## Pilkington Laminated Glass Mullions

The latest development in mullions, or fins, is composite glass – mullions made from laminated glass giving the designer greater design options.

- Vertical and horizontal applications possible
- Enhanced structural durability – offering design solutions for the ever more demanding markets and applications
- Offers opportunity to reduce mullion depth and need for lateral bracing

### Planar™ | SentryGlas® Plus System

The latest addition to the Pilkington **Planar™** range is the **Planar™ | SentryGlas® Plus System**, born from a unique collaboration between Pilkington Engineers and the scientists at DuPont™. This high performance laminated system offers the benefits of:

- Increased strength
- Reduced weight of glass and structure
- Longer spans with reduced fixings
- Reduced weight of glass and structure
- Increased safety – even when broken
- Incredible clarity, particularly when combined with Pilkington **Optiwhite™** low-iron glass
- Structural glass fin applications



*Convention Centre, Ontario, CA, USA.*



Certification No. FM22811



Agreement Certificate No. 97/3360

## Pilkington **Planar**™. Most tested. Most trusted.

Pilkington **Planar**™ gives you the reassurance of over 40 years of testing and development.

Our testing is on-going, as new projects demand higher performance. And all custom applications are researched, developed and tested before they are allowed into service.

Pilkington **Planar**™ can be tested by Pilkington Research and Development or by an independent body at your request. These include Smith Emery in the USA, Taywood Engineering, BBA, BRE, Salford University (acoustic laboratory), National Physics Laboratory and BSI in the UK, CSTB in France, Germany's Otto Graff Institute and NSG of Japan.

Specific results for everything from bomb blast loading to seismic performance are used by Pilkington engineers in project design. In addition, we are prepared to carry out full scale tests on an unprecedented scale to prove Pilkington **Planar**™ can meet the required specification.

The knowledge we have acquired over 40 years of testing has allowed us to develop a Code of Practice for structural glass façades. Every part of every Pilkington **Planar**™ solution is designed in accordance with its criteria. Such control means we can give Pilkington **Planar**™ a 12-year design and materials warranty, and give you total confidence in its ability to meet and exceed the requirements of your project.

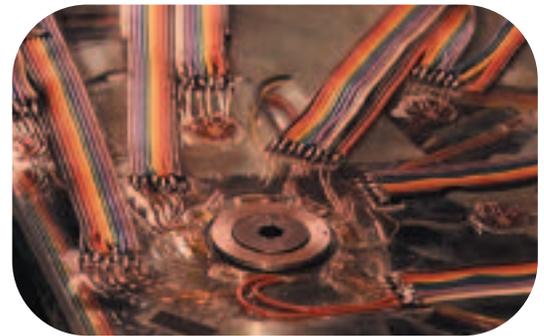
Plus, Pilkington **Planar**™ is never sold as glass or hardware alone, but always as a complete system; the design of which remains the responsibility of Pilkington, giving you absolute reassurance.



*Kang Nam test rig.*

## The highest quality and the widest range of glass

Structural glass façades depend on the quality of the glass for their performance and aesthetic effect. With Pilkington this is assured. All toughened glass will be supplied heat soaked to international specifications, e.g. prEN 14179-1, DIN 18516. This ensures a higher quality product which is much less susceptible to breakage.



*Hole stress evaluation test.*

Our expertise in glass manufacture means we can also place a vast array of glass types at your disposal. This gives you total flexibility of performance, appearance and transparency; and allows you to meet all requirements, functional or aesthetic.

## Glass Types

### Pilkington Laminated Safety Glass

For greater confidence in vertical roof or inclined applications, Pilkington Laminated Safety Glass has been designed to maintain panel integrity in the event of breakage. Pilkington **Planar**™ incorporating Pilkington Laminated Safety Glass has been thoroughly tested for wind load, seismic movements, blast resistance, hurricane and impact resistance.

## Pilkington Insulating Glass Units

Insulating glass units that offer excellent reliability, highly consistent quality and optimum thermal insulation. They can incorporate Pilkington Laminated Safety Glass and a range of other Pilkington glass types.

## Pilkington Optifloat™

Top quality clear float glass, from the world leaders and inventors of the float glass process.

## Pilkington Optiwhite™

Pilkington **Planar™** incorporating Pilkington **Optiwhite™** increases the amount of visible light that can pass through the glass by reducing the iron content during the float glass manufacturing process.



*The Rutland Building, Edinburgh, Scotland.*



*Winter Garden at the World Financial Center, New York.*

## Pilkington Optifloat™ Tint and Pilkington Arctic Blue™ body-tinted glass

Pilkington **Optifloat™** Green, Grey, Bronze and Pilkington **Arctic Blue™** offer excellent solar control, enhancing the interior environment.

## Pilkington K Glass™ and Pilkington Optitherm™ SN

A unique low emissivity coating on the surface of Pilkington **K Glass™** gives it superb energy management properties. Insulating units incorporating Pilkington **K Glass™** offer up to 30 per cent better insulation than conventional units. Pilkington **Optitherm™** SN is a super neutral, off-line, low emissivity glass for use in insulating glass units offering excellent thermal insulation.



*Helsinki Station, Finland.*

## Pilkington Suncool™ HP

Pilkington **Suncool™** HP offers an exciting range of energy management glass in a variety of striking colours which can be used in Pilkington **Planar™** Insulating Glass Units. This allows the specifier maximum flexibility in choosing the level of performance that suits the project's needs.

## Pilkington Decorative Glass

Choose from a selection of acid etched or screen printed glass, to achieve a range of stunning visual effects.



*Pulrose Power Station,  
Isle of Man, UK.*



*The Rutland Building,  
Edinburgh, UK.*



*905J fitting to glass mullion.*



*Glass mullion splice connection.*



*905 Single glazed fitting to steelwork.*



*Seismic casting.*



*Customised casting.*

## Pilkington **Planar**™ fittings

The fittings in the Pilkington **Planar**™ system offer the ideal balance between durability and appearance. Manufactured from 316 grade stainless steel, highly engineered and tested components allow Pilkington to offer the smallest, most aesthetically pleasing fittings available, without compromising performance. And specially customised fittings are always available.

### The 902 fitting

Fixes indirectly to the secondary structure by means of Pilkington **Planar**™ spring plate brackets. The 902 can accommodate any angle of slope, making it ideal for roofs and canopies.

### The 905 fitting

The most popular Pilkington **Planar**™ fitting. Eliminates the need for spring plates and allows absorption of live loads and thermal expansion by rotation round a steel pin connected to the back up structure.

### Seismic casting

Accommodates large lateral movements by the use of adjustable arms while maintaining an extremely flat profile.

### Four and two point castings

Just some of the many types of stainless steel connectors designed to connect the glass fitting to the back up structure whether structural steel or glass mullion.

We offer the most aesthetically pleasing fittings without compromising performance.



*Four point casting.*

Vertical glass curtain walls whose performance is assured by testing.

## Glass mullion systems

The use of Pilkington **Planar**<sup>™</sup> in combination with a glass mullion system creates the ultimate in transparency.

Glass mullions are used to transfer wind loading to the structure. Pilkington have led the way in the development and testing of this design technology.



*The Marriott Hotel, Kensington, UK. (above and left)*

Structures of this type are usually suspended from the structure above, with the glass panels fastened to the mullions by Pilkington **Planar**<sup>™</sup> fittings. This means the weight of both the panels and the mullions is carried by the connection at the head of each fin. This allows you to design very high façades that don't exert large in-plane loads on the Pilkington **Planar**<sup>™</sup> panels.

In places of high seismic activity, glass mullion projects must be suspended in this way. And Pilkington **Planar**<sup>™</sup> has an enviable pedigree in such areas, as its excellent performance in the San Francisco Bay, Kobe and Taiwan earthquakes testifies.



*BMW showroom, Milan, Italy.*

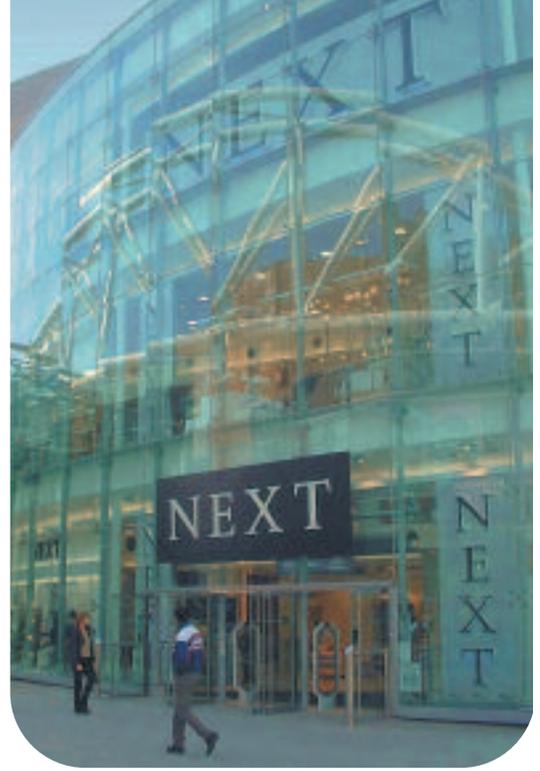
*Mall at Millenia,  
Orlando, USA.*



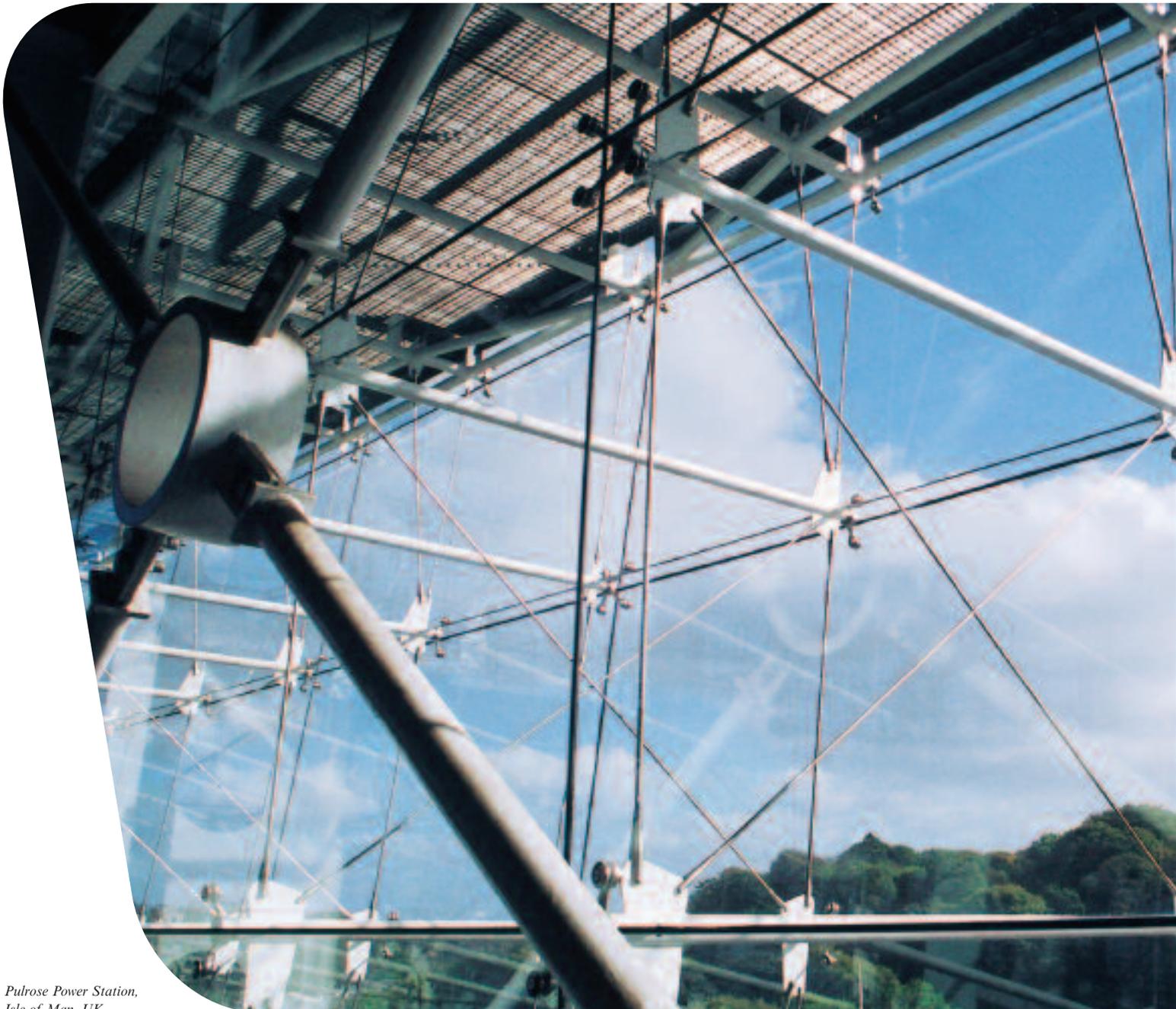
*American Stores,  
Salt Lake City, USA.*



*Taide Museum, Finland.*



*Bullring, Birmingham, UK.*



*Pulrose Power Station,  
Isle of Man, UK.*

## Steel structures

Various forms of steel structures can be used to support a Pilkington **Planar**™ façade. The design of these structures can be varied and either simple, in the form of mullions, or intricate in the form of trusses. The versatility of the Pilkington **Planar**™ connections enables almost any type of structure to be used.



*American Bible Society, New York City, NY, USA.*



*Kuwait Chamber of Commerce, Kuwait.*



*Royal Bank of Scotland, Edinburgh, UK.*

## Pilkington **Planar™ T.S.** (Tension Structures)

Pilkington has been at the forefront of structural glass testing and design for over 40 years.

The Pilkington **Planar™ T.S.** System has combined the back up structure and the glass into one sole source of system supply.

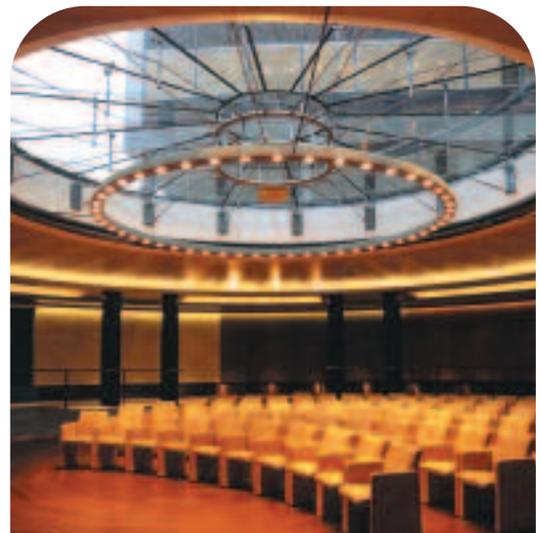
### A proven performance

Pilkington **Planar™ T.S.** has already met performance requirements for seismic loads, live and dead loads and wind loading up to hurricane force.

We also offer a full technical design service, starting with the basic design concept and leading through to 2D and 3D analysis, full performance specifications, design drawings and, via a network of specialist subcontractors, budgets leading to the bid process.

In addition, there are many examples of Pilkington **Planar™ T.S.** in acclaimed projects around the world. These include: Procter & Gamble, Surrey, UK; Stadthalle, Germany; Hayden Planetarium, New York; The University of Connecticut, Stamford, USA; Rolex, Geneva.

*Rolex HQ, Geneva,  
Switzerland.*





*Nasdaq Times Square, NY, USA.*



*Hayden Planetarium,  
American Museum of Natural History,  
New York, USA.*



*Lebanese Order of  
Physicians, Beirut.*



*Cheltenham Ladies College, UK.*



## Pilkington Planar™ T.S. design concepts

Three forms of tension assisted glass wall systems form the basis of the standardized Pilkington Planar™ T.S. system.



### Series 1

Primary truss with secondary rigging system.

- Most conventional truss fabrication
- Most rigid
- Most economical



### Series 2

Bow string truss.

- Transmits no tension forces into boundary structure
- Erects quickly
- Middle range of transparency
- Middle range of pricing

### Series 3

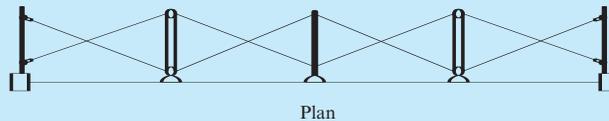
Cable truss.

- Generates highest tensile load into boundary structure
- Requires increased support stiffness
- Lightweight
- Maximum transparency

*The drawings shown are representations of each series and are not to be limiting in any way.*

### Series 1

Primary truss with secondary rigging system.



Vertical section at truss



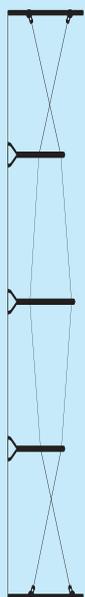
Vertical section



Plan

## Series 2

Bow string truss.



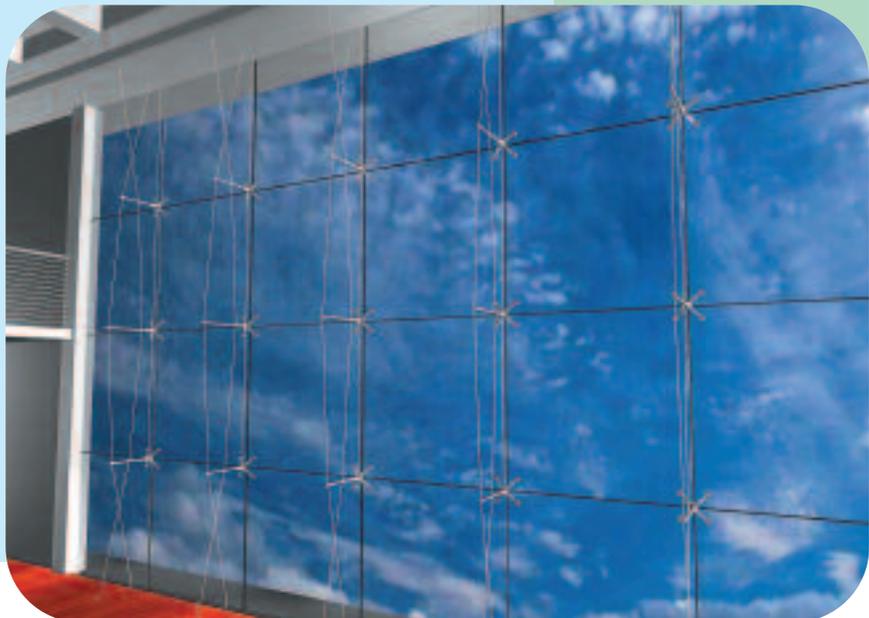
Vertical section



Plan

## Series 3

Cable truss.



## The perfect system for skylights and canopies



*Buchanan Galleries, Glasgow, UK.*

The design flexibility of Pilkington **Planar**<sup>™</sup> and its elimination of metal framing makes it the perfect choice for horizontal and overhead glazing.

Pilkington Architectural has extensive experience in the supply of glazing for canopies and sky lights and the Pilkington **Planar**<sup>™</sup> system can be specified with confidence for such applications. The extensive seismic, bomb blast, impact, wind load and durability testing procedure which has been carried out on the system has been undertaken to provide this confidence and to support the design process.



*Royal Infirmary, Edinburgh, UK.*



*Fox Plaza, Century City, California, USA.*



*BAE, Edinburgh, UK.*



*Bullring,  
Birmingham, UK.*



*Muni Metro, San Francisco, USA.*



*Jephson Gardens, Royal Leamington Spa, UK.*



*Belfast Waterfront Hall,  
Belfast.*



*Bartley Wood, Hook, UK.*

## Technical considerations

- The back up structure is required to carry snow loads and resist negative wind pressures through the fixing locations.
- Large spans are possible if underlying purlins are reinforced with cable tensioned rod-rigging.
- Pilkington **Planar**™ requires only a 3-degree slope to eliminate ponding on the glass.



*Admirals Club, DFW Airport,  
Dallas, TX, USA.*

*This publication gives a general description of the product and materials. It is the responsibility of the user of this document to ensure that their use is appropriate for any particular application and that such application complies with all relevant local and national legislation, standards, codes of practice and other requirements. Pilkington hereby disclaims all liability howsoever arising from any error in or omission from this publication and all consequences of relying on it.*

Further information  
[www.pilkington.com/planar](http://www.pilkington.com/planar)



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## Pilkington Planar™ System Information

### Single glass – flat and curved

#### Single Pilkington Planar™ Glazing – Performance

| Glass Type              | Colour | Thickness (mm) | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m²K) | R <sub>w</sub> Value (dB) |    |
|-------------------------|--------|----------------|------------------------|----------------------|--|---------------------------|-----------------|---------------------------|----|
| Pilkington Optifloat™   | Clear  | 10             | 0.87                   | 0.08                 | 0.78                                   | 0.90                      | 5.6             | 34                        |    |
|                         |        | 12             | 0.85                   | 0.08                 | 0.75                                   | 0.86                      | 5.5             | 35                        |    |
|                         |        | 15             | 0.83                   | 0.08                 | 0.71                                   | 0.82                      | 5.5             | 36                        |    |
|                         |        | 19             | 0.81                   | 0.07                 | 0.67                                   | 0.77                      | 5.3             | 40                        |    |
| Pilkington Optifloat™   | Bronze | 10             | 0.32                   | 0.05                 | 0.46                                   | 0.53                      | 5.6             | 34                        |    |
|                         |        | Grey           | 10                     | 0.26                 | 0.05                                   | 0.46                      | 0.53            | 5.6                       | 34 |
|                         |        | Green          | 10                     | 0.67                 | 0.07                                   | 0.51                      | 0.59            | 5.6                       | 34 |
| Pilkington Optiwhite™   | Clear  | 10             | 0.90                   | 0.08                 | 0.89                                   | 1.02                      | 5.6             | 34                        |    |
|                         |        | 12             | 0.90                   | 0.08                 | 0.88                                   | 1.01                      | 5.6             | 35                        |    |
|                         |        | 15             | 0.90                   | 0.08                 | 0.87                                   | 1.00                      | 5.5             | 36                        |    |
|                         |        | 19             | 0.89                   | 0.08                 | 0.86                                   | 0.99                      | 5.3             | 40                        |    |
| Pilkington Arctic Blue™ | Blue   | 10             | 0.38                   | 0.05                 | 0.42                                   | 0.48                      | 5.6             | 34                        |    |
| Pilkington Activ™ Clear | Clear  | 10             | 0.81                   | 0.14                 | 0.74                                   | 0.85                      | 5.6             | 34                        |    |
| Pilkington Activ™ Blue  | Blue   | 10             | 0.35                   | 0.13                 | 0.38                                   | 0.44                      | 5.6             | 34                        |    |

Technical data has been calculated according to EN 410 and EN 673. The above table has been updated to take into account the declared values of radiation and thermal properties required for CE Marking.

#### Single Pilkington Planar™ – Glass Types

| Glass Type   | Flat | Curved | Notes  |
|--|------|--------|--|
| Pilkington Optifloat™ Clear                        | ✓    | ✓      |  |
| Pilkington Optifloat™ Bronze/Grey/Green            | ✓    | ✓      |  |
| Pilkington Optiwhite™                              | ✓    | ✓      |  |
| Pilkington Arctic Blue™                            | ✓    | ✓      |  |
| Pilkington Activ™ Clear and Pilkington Activ™ Blue | ✓    |        |  |
| Pilkington Decorative Glass Screen Printed         | ✓    | ✓      | Maximum screened area 2400 x 4500mm<br>(See enclosed data sheet for further details) |

#### Specification – flat single Pilkington Planar™

##### Flat glass

|              |          |        |
|--------------|----------|--------|
| Thicknesses: | 10, 12mm | ±0.3mm |
|              | 15mm     | ±0.5mm |
|              | 19mm     | ±1.0mm |

##### Flat glass size – rectangles

|                     |               |                        |
|---------------------|---------------|------------------------|
| Maximum:            | 2400 x 4800mm | ±1mm                   |
| Minimum:            | 300 x 500mm   | ±1mm                   |
| Aspect ratio:       | 14:1          | Larger on request      |
| Diagonal tolerance: | Up to 4m:     | 3mm Maximum difference |
|                     | Over 4m       | 4mm Maximum difference |

##### Flat shape capability – simple shapes

All tolerances will vary depending on the complexity of shape.

##### Bow

|              |      |                        |
|--------------|------|------------------------|
| Maximum bow: | 0.1% | (Float glass)          |
|              | 0.2% | (Ceramic coated glass) |

##### Roller wave

|                         |        |
|-------------------------|--------|
| Mean roller wave depth: | 0.02mm |
| Maximum edge dip:       | 0.25mm |

Roller wave is usually parallel to the short side and in coated glass should be glazed horizontal where possible.

##### Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or chips at edges will be ground out prior to toughening and do not constitute reason for rejection. Corners may be dubbed. Some variation in edgework may be discernible on exposed edges where different machines and/or hand forming is a requirement for manufacture. Such variations shall be kept to a minimum.

##### Hole drilling – rectangles

|            |  |
|------------|--|
| Diameter:  | 19mm ±1mm (countersunk)  |
| Position:  | Normally 60mm from glass edge at corners and sometimes along edge. Other configurations subject to confirmation. |
| Tolerance: | ±2mm from one datum point.   |
| Number:    | Up to 10 (larger on request)   |

### Toughening stress

Thermally toughened soda lime silicate safety glass to EN 12150  
Classified as 1(C)1 to EN 12600. Checked regularly during production  
by fracture count or the Differential Stress Refractometer (DSR) method.

### Heat soak testing

All toughened glass (Pilkington T glass) will be supplied heat soaked to or  
in excess of international specifications eg. EN 14179-1.

### Glass marking

Glass will be marked with the Pilkington toughening stamp and will show  
compliance with regulatory requirements. The mark will be on each glass pane.

### Visual quality

Roller wave and natural bow in toughened glass have minimal effect on  
vision in transmission but can be observed in reflection, obviously more  
with reflective glass. This is kept to a minimum with the very low roller  
wave and bow in Pilkington T glass Plus. Site inspection should be from a  
distance of 3m and viewed at right angles to the glass.

### Installation

Whilst the Pilkington **Planar**<sup>™</sup> system is completely weatherproof, the  
components are not designed to be left in contact with water for extended  
periods, and adequate ventilation or drainage should be provided to allow  
the system to dry out periodically. Weatherseals used around the periphery  
must be compatible with the Pilkington **Planar**<sup>™</sup> system and approval from  
Pilkington should be sought prior to application.

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## Specification – curved single Pilkington **Planar**<sup>™</sup>

### Curved glass

|              |                        |        |
|--------------|------------------------|--------|
| Thicknesses: | 10mm, 12mm             | ±0.3mm |
|              | 15mm                   | ±0.5mm |
|              | 19mm (on request only) |        |

### Curved glass size – rectangles

|                  |                             |      |
|------------------|-----------------------------|------|
| Developed width: | 360 to 2130mm               | ±3mm |
| Length:          | 400 to 3650mm               | ±3mm |
| Aspect ratio:    | 2:1 maximum for large areas |      |
| Minimum size:    | 360 x 900mm                 | ±3mm |
| Minimum radius:  | 1000mm                      |      |
| Maximum weight:  | 350kg                       |      |

Tolerances on curves are difficult to define. In simple terms:

|                          |                                   |
|--------------------------|-----------------------------------|
| Straight edge will be:   | ±3mm from the straight            |
| Developed width will be: | 10 - 12mm ±3mm from perfect curve |
|                          | 15mm ±4mm from perfect curve      |
|                          | 19mm ±5mm from perfect curve      |

*Note: 'developed width' means the width of glass pane prior to bending.*

*Torsion ±5mm per metre measured along the straight edge.*

### Curved shape capability

Rectangles and simple rakes. All tolerances will vary depending on  
complexity of shape.

### Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or  
chips at edges will be ground out prior to toughening and do not constitute  
reason for rejection. Corners may be dubbed.

Some variation in edgework may be discernible on exposed edges where  
different machine and/or hand forming is a requirement for manufacture.  
Such variations shall be kept to a minimum.

### Hole drilling

|            |   |
|------------|---|
| Diameter:  | 19mm ±1mm countersunk   |
|            | Curved glass countersunk on convex side only.   |
| Position:  | Normally 60mm from glass edge at corners and sometimes<br>along edge. Other configurations subject to confirmation. |
| Tolerance: | ± 2mm from one datum point  |
| Number:    | Up to 10  |

### Toughening stress

Thermally toughened soda lime silicate safety glass to EN 12150.  
Checked regularly during production by fracture count or the Differential  
Stress Refractometer (DSR) method.

### Heat soak testing

All toughened glass will be supplied heat soaked to or in excess of  
international specifications eg. EN 14179-1.

### Glass marking

Glass will be marked with the Pilkington toughening stamp and will show  
compliance with regulatory requirements. The mark will be on each glass pane.

### Visual quality

A degree of distortion, both when looking through and in reflection, is  
inevitable in curved toughened glass, particularly when viewing a moving  
object through the glass. All curved glass should be site inspected from a  
minimum distance of 3m and viewed at right angles to the glass. It should  
also be noted that toughened curved glass will split direct sunlight into  
striped shadow.

### Installation

Whilst the Pilkington **Planar**<sup>™</sup> system is completely weatherproof, the  
components are not designed to be left in contact with water for extended  
periods, and adequate ventilation or drainage should be provided to allow  
the system to dry out periodically. Weatherseals used around the periphery  
must be compatible with the Pilkington **Planar**<sup>™</sup> system and approval from  
Pilkington should be sought prior to application.

### General Notes – Curved Glazing

Curved Pilkington **Planar**<sup>™</sup> applications are the subject of continuing  
development and enquiries are welcomed for projects furthering current  
specifications and usage. Special fittings have been designed for curved  
glazing and particular torque settings determined. The angle of spring plate  
or 905 bar must suit the curve radius. At time of printing, the support  
structure must lie on the concave side of the glass but can be internally or  
externally located. The curve may be on any plane.

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This publication gives a general description of the product and materials. It is the responsibility of the users of this document to ensure that the proposed application of the product is appropriate and that such application complies with all relevant local and national legislation, standards, codes of practice and other requirements. To the extent allowed by law, Pilkington United Kingdom Limited, hereby disclaims all liability howsoever arising from any error in or omission from this publication and all consequences of relying on it. For more information about Pilkington **Planar**<sup>™</sup>, please visit [www.pilkington.co.uk/planar](http://www.pilkington.co.uk/planar)



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## Pilkington Planar™ System Information

### Pilkington Planar™ Insulating Glass Units (IGUs)

Pilkington Architectural offer a wide range of coated performance glasses for incorporation from the Pilkington Planar™ system. A selection of such products and performance data is indicated below:

#### Pilkington Planar™ IGUs with 6mm Pilkington Optifloat™ Clear inner pane and 16mm airspace

| Outer Pane Glass Type   | Colour / Performance | Thickness (mm) | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m <sup>2</sup> K) | R <sub>w</sub> Value (dB) |
|-------------------------|----------------------|----------------|------------------------|----------------------|--|---------------------------|------------------------------|---------------------------|
| Pilkington Optifloat™   | Clear                | 10             | 0.77                   | 0.14                 | 0.67                                   | 0.77                      | 2.7                          | 38                        |
|                         |                      | 12             | 0.76                   | 0.14                 | 0.64                                   | 0.74                      | 2.7                          | 38                        |
|                         |                      | 15             | 0.74                   | 0.13                 | 0.60                                   | 0.69                      | 2.7                          | 40                        |
| Pilkington Optifloat™   | Bronze               | 10             | 0.28                   | 0.06                 | 0.34                                   | 0.39                      | 2.7                          | 38                        |
|                         |                      | 10             | 0.23                   | 0.05                 | 0.34                                   | 0.39                      | 2.7                          | 38                        |
|                         |                      | 10             | 0.60                   | 0.10                 | 0.39                                   | 0.45                      | 2.7                          | 38                        |
| Pilkington Optiwhite™   | Clear                | 10             | 0.80                   | 0.15                 | 0.78                                   | 0.90                      | 2.7                          | 38                        |
|                         |                      | 12             | 0.80                   | 0.15                 | 0.78                                   | 0.90                      | 2.7                          | 38                        |
|                         |                      | 15             | 0.80                   | 0.15                 | 0.77                                   | 0.89                      | 2.7                          | 40                        |
| Pilkington Arctic Blue™ | Blue                 | 10             | 0.34                   | 0.06                 | 0.30                                   | 0.34                      | 2.7                          | 38                        |
| Pilkington Activ™ Clear | Clear                | 10             | 0.73                   | 0.19                 | 0.64                                   | 0.74                      | 2.7                          | 38                        |
| Pilkington Activ™ Blue  | Blue                 | 10             | 0.31                   | 0.14                 | 0.27                                   | 0.31                      | 2.7                          | 38                        |
| *Planar Sun             | 70/40                | 10             | 0.68                   | 0.09                 | 0.41                                   | 0.47                      | 1.4                          | 38                        |
| *Planar Sun             | 66/33                | 10             | 0.63                   | 0.15                 | 0.35                                   | 0.40                      | 1.3                          | 38                        |
| *Planar Sun             | 50/25                | 10             | 0.48                   | 0.10                 | 0.26                                   | 0.30                      | 1.3                          | 38                        |
| *Planar Sun             | 73/39                | 10             | 0.69                   | 0.10                 | 0.40                                   | 0.46                      | 1.4                          | 38                        |
| *Planar Sun             | 52/29                | 10             | 0.50                   | 0.09                 | 0.30                                   | 0.34                      | 1.4                          | 38                        |
| *Planar Sun             | 68/34                | 10             | 0.64                   | 0.09                 | 0.36                                   | 0.41                      | 1.3                          | 38                        |
| *Planar Sun             | 70/36                | 10             | 0.67                   | 0.12                 | 0.38                                   | 0.44                      | 1.3                          | 38                        |

\*Please note that these are a selection of Solar Control glasses within the range and the performance data supplied is indicative only and can vary subject to the substrate used. Please check current availability of the coated product range at [www.pilkington.com/planarcoatedupdate](http://www.pilkington.com/planarcoatedupdate) at the time of specification. It is strongly recommended that indicative 6/12/6 colour samples are viewed and approved as the basis for colour selection. It should be noted that although the performance data of some of the products are very similar there may still be colour differences.

#### Pilkington Planar™ IGUs with 6mm Pilkington K Glass™ inner pane and 16mm airspace

| Outer Pane Glass Type   | Colour / Performance | Thickness (mm) | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m <sup>2</sup> K) | R <sub>w</sub> Value (dB) |
|-------------------------|----------------------|----------------|------------------------|----------------------|--|---------------------------|------------------------------|---------------------------|
| Pilkington Optifloat™   | Clear                | 10             | 0.71                   | 0.17                 | 0.64                                   | 0.74                      | 1.7                          | 38                        |
|                         |                      | 12             | 0.70                   | 0.16                 | 0.60                                   | 0.69                      | 1.7                          | 38                        |
|                         |                      | 15             | 0.68                   | 0.16                 | 0.56                                   | 0.64                      | 1.7                          | 40                        |
| Pilkington Optifloat™   | Bronze               | 10             | 0.26                   | 0.06                 | 0.29                                   | 0.33                      | 1.7                          | 38                        |
|                         |                      | 10             | 0.21                   | 0.06                 | 0.29                                   | 0.33                      | 1.7                          | 38                        |
|                         |                      | 10             | 0.55                   | 0.12                 | 0.35                                   | 0.40                      | 1.7                          | 38                        |
| Pilkington Optiwhite™   | Clear                | 10             | 0.74                   | 0.18                 | 0.75                                   | 0.86                      | 1.7                          | 38                        |
|                         |                      | 12             | 0.74                   | 0.18                 | 0.74                                   | 0.85                      | 1.7                          | 38                        |
|                         |                      | 15             | 0.73                   | 0.17                 | 0.74                                   | 0.85                      | 1.7                          | 40                        |
| Pilkington Arctic Blue™ | Blue                 | 10             | 0.31                   | 0.07                 | 0.25                                   | 0.29                      | 1.7                          | 38                        |
| Pilkington Activ™ Clear | Clear                | 10             | 0.67                   | 0.22                 | 0.61                                   | 0.70                      | 1.7                          | 38                        |
| Pilkington Activ™ Blue  | Blue                 | 10             | 0.28                   | 0.15                 | 0.23                                   | 0.26                      | 1.7                          | 38                        |

#### Pilkington Planar™ IGUs with 8mm Pilkington Optitherm™ SN, inner pane and 16mm airspace

| Outer Pane Glass Type   | Colour / Performance | Thickness (mm) | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m <sup>2</sup> K) | R <sub>w</sub> Value (dB) |
|-------------------------|----------------------|----------------|------------------------|----------------------|--|---------------------------|------------------------------|---------------------------|
| Pilkington Optifloat™   | Clear                | 10             | 0.75                   | 0.11                 | 0.57                                   | 0.66                      | 1.4                          | 38                        |
|                         |                      | 12             | 0.73                   | 0.11                 | 0.55                                   | 0.63                      | 1.4                          | 38                        |
|                         |                      | 15             | 0.72                   | 0.10                 | 0.52                                   | 0.60                      | 1.4                          | 40                        |
| Pilkington Optifloat™   | Bronze               | 10             | 0.27                   | 0.05                 | 0.25                                   | 0.29                      | 1.4                          | 38                        |
|                         |                      | 10             | 0.23                   | 0.05                 | 0.25                                   | 0.29                      | 1.4                          | 38                        |
|                         |                      | 10             | 0.58                   | 0.08                 | 0.34                                   | 0.39                      | 1.4                          | 38                        |
| Pilkington Optiwhite™   | Clear                | 10             | 0.78                   | 0.12                 | 0.65                                   | 0.75                      | 1.4                          | 38                        |
|                         |                      | 12             | 0.77                   | 0.11                 | 0.65                                   | 0.75                      | 1.4                          | 38                        |
|                         |                      | 15             | 0.77                   | 0.11                 | 0.64                                   | 0.74                      | 1.4                          | 40                        |
| Pilkington Arctic Blue™ | Blue                 | 10             | 0.33                   | 0.06                 | 0.24                                   | 0.28                      | 1.4                          | 38                        |
| Pilkington Activ™ Clear | Clear                | 10             | 0.70                   | 0.17                 | 0.54                                   | 0.62                      | 1.4                          | 38                        |
| Pilkington Activ™ Blue  | Blue                 | 10             | 0.30                   | 0.14                 | 0.22                                   | 0.25                      | 1.4                          | 38                        |

Technical data has been calculated according to EN 410 and EN 673.

The above table has been updated to take into account the declared values of radiation and thermal properties required for CE Marking.

## Pilkington **Planar**™ Units – Glass Types

| Glass Type  | Colour        | 6mm | 8mm | 10mm | 12mm | 15mm | 19mm | Notes  |
|---|---------------|-----|-----|------|------|------|------|--|
| Pilkington <b>Optifloat</b> ™   | Clear         | ✓   | ✓   | ✓    | ✓    | ✓    | ✓    |  |
| Pilkington <b>Optifloat</b> ™   | Grey          | ✓   |     | ✓    |      |      |      |  |
|   | Bronze        | ✓   |     | ✓    |      |      |      |  |
|   | Green         | ✓   |     | ✓    |      |      |      |  |
| Pilkington <b>Optiwhite</b> ™   | Clear         | ✓   |     | ✓    | ✓    | ✓    | ✓    |  |
| Pilkington <b>Arctic Blue</b> ™                                       | Blue          | ✓   |     | ✓    |      |      |      |  |
| Pilkington <b>K Glass</b> ™   | Clear         | ✓   |     |      |      |      |      |  |
| Pilkington <b>Optitherm</b> ™ SN                                      | Clear         |     | ✓   |      |      |      |      | <i>Subject to minimum quantity. Max. size 2400 x 4800mm</i>                                  |
| Planar Sun  |               | ✓   |     | ✓    |      |      |      | <i>Subject to minimum quantity. Max. size 2400 x 4800mm</i>                                  |
| Pilkington Decorative Glass<br>Screen Printed                         |               | ✓   | ✓   | ✓    | ✓    | ✓    | ✓    | <i>Maximum screened area 2400 x 4500mm<br/>(See enclosed data sheet for further details)</i> |
| Pilkington <b>Activ</b> ™ Clear<br>and Pilkington <b>Activ</b> ™ Blue | Clear<br>Blue | ✓   |     | ✓    |      |      |      |  |

## Specification – Pilkington **Planar**™ IGUs

### Composition

Pilkington **Planar**™ IGUs are manufactured from two Pilkington T glass Plus panes and reference should be made to the Single Pilkington **Planar**™ Specification for technical data which is not contained herein.

### Outer glass

Outer glass to conform to single Pilkington **Planar**™ specification.

### Inner glass

Thickness: 6mm ±0.2mm  
8, 10, 12mm ±0.3mm

### Pilkington **Planar**™ Insulating Glass Units

Airspace: 16mm ±1mm  
Depth of silicone seal: Minimum 4mm  
Aluminium spacer depth: 7mm  
Sight line of unit edge seal: 12mm min. 20mm max.  
Spacer colour: Black or natural  
Overall thickness: ±2mm tolerance

### Glass size – rectangles

Maximum: 2400 x 4800mm 0 + 4.5mm  
Minimum: 300 x 500mm 0 + 4.5mm  
Aspect ratio: 14:1 Maximum  
Diagonal tolerances: Up to 4m: 3mm Maximum difference  
Over 4m: 4mm Maximum difference  
Overall thickness: 80mm Maximum

### Shape capability

Rectangles and simple shapes. All tolerances will vary depending on the complexity of shape.

### Roller wave – both glasses in same direction

Standard mean roller wave depth: 0.02mm  
Planar Sun and Pilkington **Optitherm**™ SN  
mean roller wave length: 0.05mm  
Maximum edge dip: 0.25mm  
Roller wave is usually parallel to the short side and in coated glasses should be glazed horizontally where possible.

### Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or chips at edges will be ground out prior to toughening and do not constitute reason for rejection. Corners may be dubbed. Some variation in edgework may be discernible on exposed edges where different machines and/or hand forming is a requirement for manufacture. Such variations shall be kept to a minimum.

Where the detail of a structure is such that the double glazing edge sealant is fully exposed, minor undulations in the edge seal may be discernible particularly near corners of the unit.

### Hole drilling – rectangles

Diameter: 34mm ±1mm  
Diameter: 19mm ±1mm Countersunk  
Position: Normally 60mm from glass edge at corners and sometimes along edge. Other configurations subject to confirmation.  
Tolerance: ±2mm from one datum point.  
Number: Up to 10

### Toughening stress

Thermally toughened soda glass silicate safety glass to EN 12150. Classified as 1 (C) 1 to EN 12600. Checked regularly during production by fracture count or the Differential Stress Refractometer (DSR) method.

### Heat soak testing

All toughened glass will be supplied heat soaked to or in excess of international specifications eg. EN 14179-1.

### Glass marking

Glass will be marked with the Pilkington toughening stamp and will show compliance with regulatory requirements. The mark will be on each glass pane. Multiple panes will not necessarily be marked in the same corner.

### Visual quality

#### Distortion

Pilkington **Planar**™ IGUs are manufactured from two Pilkington T glass Plus panes which have minimal effect on visual transmission through the glass but some distortion can be seen in reflection. The air in all sealed units expands and contracts in hot and cold weather causing the glass to bow out and in respectively and again reflections will reflect this movement. On occasion such effects can be increased by the specification of a coated glass. Site inspection should be from a distance of 3m and at right angles to the glass.

#### Installation

Whilst the Pilkington **Planar**™ system is completely weatherproof, the components are not designed to be left in contact with water for extended periods, and adequate ventilation or drainage should be provided to allow the system to dry out periodically. Weatherseals used around the periphery must be compatible with the Pilkington **Planar**™ system and approval from Pilkington should be sought prior to application.

This publication gives a general description of the product and materials. It is the responsibility of the users of this document to ensure that the proposed application of the product is appropriate and that such application complies with all relevant local and national legislation, standards, codes of practice and other requirements. To the extent allowed by law, Pilkington United Kingdom Limited, hereby disclaims all liability howsoever arising from any error in or omission from this publication and all consequences of relying on it.



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# Pilkington Planar™ System Information

## Single Pilkington Planar™ Laminated Safety Glass

Single Pilkington Planar™ Laminated Safety Glass  
Performance of typical combinations with clear interlayer

| Pilkington T glass Plus Outer Leaf | Heat Strengthened or Pilkington T glass Plus Inner Leaf | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m²K) | R <sub>w</sub> Value (dB) |
|------------------------------------|---|------------------------|----------------------|--|---------------------------|-----------------|---------------------------|
| Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear                      |                        |                      |  |                           |                 |                           |
| 10mm                               | 4mm   | 0.83                   | 0.08                 | 0.69                                   | 0.79                      | 5.4             | 38                        |
| 10mm                               | 6mm   | 0.82                   | 0.08                 | 0.68                                   | 0.78                      | 5.4             | 39                        |
| 12mm                               | 6mm   | 0.81                   | 0.07                 | 0.65                                   | 0.75                      | 5.3             | 39                        |
| 15mm                               | 6mm   | 0.79                   | 0.07                 | 0.63                                   | 0.72                      | 5.2             | 40                        |
| Pilkington <b>Optiwhite™</b>       | Pilkington <b>Optiwhite™</b>                            |                        |                      |  |                           |                 |                           |
| 10mm                               | 4mm   | 0.89                   | 0.08                 | 0.82                                   | 0.94                      | 5.4             | 38                        |
| 10mm                               | 6mm   | 0.88                   | 0.08                 | 0.81                                   | 0.93                      | 5.4             | 39                        |
| 12mm                               | 6mm   | 0.88                   | 0.08                 | 0.81                                   | 0.93                      | 5.3             | 39                        |
| 15mm                               | 6mm   | 0.87                   | 0.08                 | 0.80                                   | 0.92                      | 5.2             | 40                        |
| Pilkington <b>Activ™</b> Clear     | Pilkington <b>Optifloat™</b> Clear                      |                        |                      |  |                           |                 |                           |
| 10mm                               | 6mm   | 0.77                   | 0.14                 | 0.64                                   | 0.74                      | 5.4             | 39                        |
| Pilkington <b>Activ™</b> Blue      | Pilkington <b>Optifloat™</b> Clear                      |                        |                      |  |                           |                 |                           |
| 10mm                               | 6mm   | 0.34                   | 0.12                 | 0.37                                   | 0.43                      | 5.4             | 39                        |

Technical data has been calculated according to EN 410 and EN 673. The above table has been updated to take into account the declared values of radiation and thermal properties required for CE Marking. R<sub>w</sub> Value is indicative for PVB interlayer product only and will be subject to minor variations dependent upon the size of the glass panels and the number of fittings required.

### Pilkington Planar™ Laminated Safety Glass – Glass Types

| Glass Type   | Colour        | 4mm    | 6mm    | 10mm   | 12mm | 15mm | 19mm | Notes  |
|--|---------------|--------|--------|--------|------|------|------|--|
| Pilkington <b>Optifloat™</b>                                     | Clear         | ✓      | ✓      | ✓      | ✓    | ✓    | ✓    |  |
| Pilkington <b>Optifloat™</b>                                     | Grey          | ✓      | ✓      | ✓      |      |      |      |  |
|  | Bronze        | ✓      | ✓      | ✓      |      |      |      |  |
|  | Green         | ✓      | ✓      | ✓      |      |      |      |  |
| Pilkington <b>Optiwhite™</b>                                     | Clear         | ✓      | ✓      | ✓      | ✓    | ✓    | ✓    |  |
| Pilkington <b>Arctic Blue™</b>                                   | Blue          | ✓      | ✓      | ✓      |      |      |      |  |
| Pilkington Decorative Glass Screen Printed                       |               | ✓      | ✓      | ✓      | ✓    | ✓    | ✓    | Maximum screened area 2000 x 3600mm<br>(See enclosed data sheet for further details) |
| Pilkington <b>Activ™</b> Clear and Pilkington <b>Activ™</b> Blue | Clear<br>Blue | ✓<br>✓ | ✓<br>✓ | ✓<br>✓ |      |      |      |  |

For Pilkington Texture Glass availability, please contact Pilkington Architectural.

#### Notes

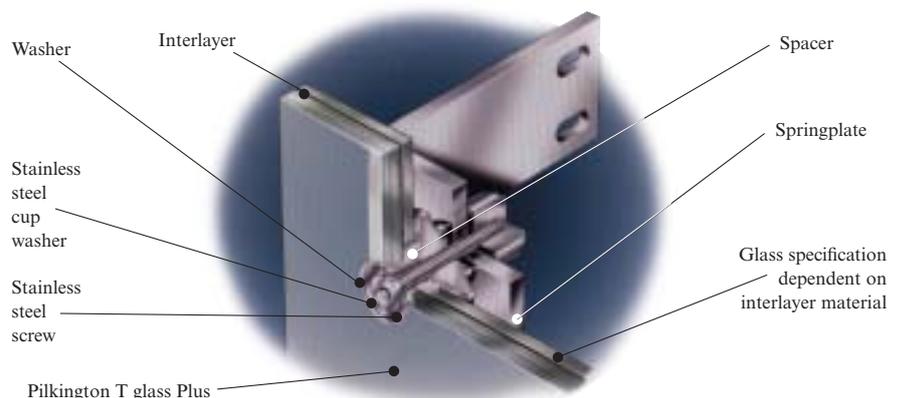
Pilkington Planar™ Laminated Safety Glasses are available with a selection of interlayers including PVB and SentryGlas®

Silicone perimeter seals must be compatible with Pilkington Laminated Safety Glass.

A wide range of glass combinations and a choice of clear, translucent and coloured interlayers are available with laminated glasses. Please refer to Pilkington Architectural for advice.

In line with regulations applicable in many European countries, Pilkington recommend the use of laminated glass in overhead or sloping overhead glazing.

### 902 Fitting to Single Pilkington Planar™ Laminated Safety Glass



## Specification – Single Pilkington **Planar**™ Laminated Safety Glass

### Indicative Glass combinations

10mm + 6mm or 4mm  
12mm + 6mm or 8mm or 10mm  
15mm + 6mm or 8mm or 10mm

### Pilkington **Planar**™ Laminated Safety Glass

Interlayer: 1.52mm or 2.28mm  
There may be a step up on each side to 3mm

### Glass size – rectangles

Maximum (4mm): 2000 x 3000mm 0 + 4mm  
Maximum (6-19mm): 2000 x 3600mm 0 + 4mm  
(Larger sizes upon request)  
Minimum: 300 x 500mm 0 + 4mm  
Aspect ratio: 14:1 Maximum

Larger glass sizes and weights greater than 350kg subject to enquiry.

### Shape capability

Rectangles and simple shapes. All tolerances will vary depending on the complexity of shape.

### Glass Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or chips at edges will be ground out prior to toughening and do not constitute reason for rejection. Corners may be dubbed.  
Some variation in edgework may be discernible on exposed edges where different machines and/or hand forming is a requirement for manufacture. Such variations shall be kept to a minimum.

### Hole drilling – rectangles

Diameter: 38mm ±1mm  
Diameter: 19mm ±1mm Countersunk  
Position: Normally 60mm from glass edge at corners and sometimes along edge. Other configurations subject to confirmation.  
Tolerance: ±2mm from one datum point  
Number: Up to 8

### Method of production

SentryGlas® or PVB.

### Toughening Stress

10/12/15/19mm glass: Pilkington T glass Plus  
(Toughened and Heat Soaked)  
4/6/8mm glass: Heat Strengthened or Pilkington T glass Plus  
as required by design

### Bow

Maximum bow: 0.15% (Float glass)  
0.2% (Ceramic coated glass)

### Roller wave

Mean roller wave depth: 0.05mm  
Maximum edge dip: 0.25mm

Roller wave is usually parallel to the short side and in coated glass should be glazed horizontal where possible.

### Glass marking

Glass will be marked with the Pilkington toughening stamp and will show compliance with regulatory requirements. The mark will be on each glass pane, usually near a corner.

Multiple panes will not necessarily be marked in the same corner.

### Visual quality

#### PVB

Advances in PVB technology in recent years have led to improved edge stability. Under natural exposure conditions the edge of a PVB laminate will be of an acceptable quality when properly installed and maintained. However the possibility of minor delamination cannot entirely be excluded. When viewed from a distance of 3m in transmission and in the vertical position, bubbles, dirt or fibres within the laminate will be considered to be unacceptable if readily visible due to their size or quantity.

#### SentryGlas®

The interlayer technology delivers increased load bearing characteristics and improved overall durability. Laminates with exposed edges shall not develop defects at edges (including holes) as characterised by the Edge Stability Number (ESN), greater than a value of 200, with no defect extending greater than 3mm normal to the chamfered edge of the laminate. Laminates will conform to the specification for process blemishes set forth in ASTM C1172-03, Table 1. When viewed from a distance of 3m in transmission and in the vertical position, bubbles, dirt or fibres within the laminate will be considered to be unacceptable if readily visible due to their size or quantity.

#### Distortion

When laminating toughened or heat strengthened glasses together slight visible distortion in transmission due to the small lens effects will be noted with increase in viewing angle. The phenomenon is not normally a problem in roof glazing, but may be discernible in vertical glazing. On occasion such effects can be increased by the specification of a coated glass. Site inspection should be from a distance of 3m and viewed at right angles to the glass.

#### Installation

Whilst the Pilkington **Planar**™ system is completely weatherproof, the components are not designed to be left in contact with water for extended periods, and adequate ventilation or drainage should be provided to allow the system to dry out periodically. Weatherseals used around the periphery must be compatible with the Pilkington **Planar**™ system and approval from Pilkington should be sought prior to application.

This publication gives a general description of the product and materials. It is the responsibility of the users of this document to ensure that the proposed application of the product is appropriate and that such application complies with all relevant local and national legislation, standards, codes of practice and other requirements. To the extent allowed by law, Pilkington United Kingdom Limited, hereby disclaims all liability howsoever arising from any error in or omission from this publication and all consequences of relying on it. For more information about Pilkington **Planar**™ please visit [www.pilkington.co.uk/planar](http://www.pilkington.co.uk/planar)



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## Pilkington **Planar**<sup>™</sup> System Information

### Pilkington **Planar**<sup>™</sup> Laminated Insulating Glass Units (IGUs)

#### Pilkington **Planar**<sup>™</sup> Laminated IGUs

Performance of typical combinations with clear interlayer

| Pilkington T glass Plus Outer Leaf             | Heat Strengthened Glasses forming Laminated Inner Leaf   | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m <sup>2</sup> K) | R <sub>w</sub> Value (dB) |    |
|--|--|------------------------|----------------------|--|---------------------------|------------------------------|---------------------------|----|
| Pilkington <b>Optifloat</b> <sup>™</sup> Clear | Pilkington <b>Optifloat</b> <sup>™</sup> Clear<br>6mm + 6mm  | 10mm                   | 0.73                 | 0.14                                   | 0.64                      | 0.74                         | 2.6                       | 41 |
|  |  | 12mm                   | 0.72                 | 0.13                                   | 0.61                      | 0.70                         | 2.6                       | 42 |
|  |  | 15mm                   | 0.70                 | 0.13                                   | 0.57                      | 0.66                         | 2.6                       | 43 |
| Pilkington <b>Optifloat</b> <sup>™</sup> Clear | Pilkington <b>K Glass</b> <sup>™</sup> & Pilkington <b>Optifloat</b> <sup>™</sup> Clear<br>6mm + 6mm | 10mm                   | 0.68                 | 0.16                                   | 0.62                      | 0.71                         | 1.7                       | 41 |
|  |  | 12mm                   | 0.67                 | 0.16                                   | 0.59                      | 0.68                         | 1.7                       | 42 |
|  |  | 15mm                   | 0.65                 | 0.15                                   | 0.55                      | 0.63                         | 1.7                       | 43 |
| Pilkington <b>Optiwhite</b> <sup>™</sup>       | Pilkington <b>Optiwhite</b> <sup>™</sup><br>6mm + 6mm  | 10mm                   | 0.81                 | 0.15                                   | 0.78                      | 0.90                         | 2.6                       | 41 |
|  |  | 12mm                   | 0.80                 | 0.15                                   | 0.78                      | 0.90                         | 2.6                       | 42 |
|  |  | 15mm                   | 0.80                 | 0.15                                   | 0.77                      | 0.89                         | 2.6                       | 43 |
| Pilkington <b>Optiwhite</b> <sup>™</sup>       | Pilkington <b>K Glass</b> <sup>™</sup> & Pilkington <b>Optiwhite</b> <sup>™</sup><br>6mm + 6mm       | 10mm                   | 0.75                 | 0.17                                   | 0.75                      | 0.86                         | 1.7                       | 41 |
|  |  | 12mm                   | 0.74                 | 0.17                                   | 0.75                      | 0.86                         | 1.7                       | 42 |
|  |  | 15mm                   | 0.74                 | 0.17                                   | 0.74                      | 0.85                         | 1.7                       | 43 |
| Pilkington <b>Activ</b> <sup>™</sup> Clear     | Pilkington <b>K Glass</b> <sup>™</sup> & Pilkington <b>Optifloat</b> <sup>™</sup> Clear<br>6mm + 6mm | 10mm                   | 0.64                 | 0.21                                   | 0.60                      | 0.69                         | 1.7                       | 41 |
| Pilkington <b>Activ</b> <sup>™</sup> Blue      | Pilkington <b>K Glass</b> <sup>™</sup> & Pilkington <b>Optifloat</b> <sup>™</sup> Clear<br>6mm + 6mm | 10mm                   | 0.27                 | 0.15                                   | 0.23                      | 0.26                         | 1.7                       | 41 |
| *Planar Sun 10mm 73/39                         | Pilkington <b>Optifloat</b> <sup>™</sup> Clear<br>6mm + 6mm  | 0.66                   | 0.10                 | 0.40                                   | 0.46                      | 1.3                          | 41                        |    |
| *Planar Sun 10mm 68/34                         | 6mm + 6mm  | 0.61                   | 0.09                 | 0.35                                   | 0.40                      | 1.3                          | 41                        |    |
| *Planar Sun 10mm 66/33                         | 6mm + 6mm  | 0.60                   | 0.15                 | 0.35                                   | 0.40                      | 1.3                          | 41                        |    |
| *Planar Sun 10mm 52/29                         | 6mm + 6mm  | 0.47                   | 0.09                 | 0.30                                   | 0.34                      | 1.3                          | 41                        |    |
| *Planar Sun 10mm 50/25                         | 6mm + 6mm  | 0.45                   | 0.09                 | 0.26                                   | 0.30                      | 1.3                          | 41                        |    |
| *Planar Sun 10mm 70/36                         | 6mm + 6mm  | 0.64                   | 0.11                 | 0.37                                   | 0.43                      | 1.3                          | 41                        |    |

\*Please note that these are a selection of Solar Control glasses within the range and the performance data supplied is indicative only and can vary subject to the substrate used. Technical data has been calculated according to EN 410 and EN 673. The above table has been updated to take into account the declared values of radiation and thermal properties required for CE Marking. R<sub>w</sub> Value is indicative for PVB interlayer product only and will be subject to minor variations dependent upon the size of the glass panels and the number of fittings required.

#### Pilkington **Planar**<sup>™</sup> Laminated IGUs – Glass Types

| Glass Type  | Colour        | 4mm | 6mm    | 8mm | 10mm   | 12mm | 15mm | 19mm | Notes  |
|---|---------------|-----|--------|-----|--------|------|------|------|--|
| Pilkington <b>Optifloat</b> <sup>™</sup>  | Clear         | ✓   | ✓      | ✓   | ✓      | ✓    | ✓    | ✓    |  |
| Pilkington <b>Optifloat</b> <sup>™</sup>  | Grey          | ✓   | ✓      |     | ✓      |      |      |      |  |
|   | Bronze        | ✓   | ✓      |     | ✓      |      |      |      |  |
|   | Green         | ✓   | ✓      |     | ✓      |      |      |      |  |
| Pilkington <b>Optiwhite</b> <sup>™</sup>  | Clear         | ✓   | ✓      |     | ✓      | ✓    | ✓    | ✓    |  |
| Pilkington <b>Arctic Blue</b> <sup>™</sup>  | Blue          | ✓   | ✓      |     | ✓      |      |      |      |  |
| Pilkington <b>K Glass</b> <sup>™</sup>  | Clear         | ✓   | ✓      |     |        |      |      |      |  |
| Planar Sun  |               |     | ✓      |     | ✓      |      |      |      | Subject to minimum quantity. Max. size 2000 x 3600mm                                 |
| Pilkington Decorative Glass<br>Screen printed   |               | ✓   | ✓      | ✓   | ✓      | ✓    | ✓    | ✓    | Maximum screened area 2000 x 3600mm<br>(See enclosed data sheet for further details) |
| Pilkington <b>Activ</b> <sup>™</sup> Clear<br>and Pilkington <b>Activ</b> <sup>™</sup> Blue | Clear<br>Blue |     | ✓<br>✓ |     | ✓<br>✓ |      |      |      |  |

## Notes

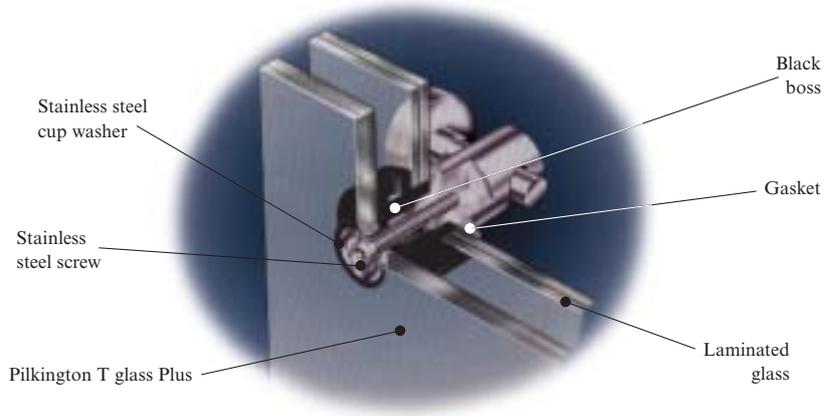
Pilkington **Planar**™ Laminated IGUs are available with a selection of interlayers including PVB and SentryGlas®.

Silicone perimeter seals must be compatible with Pilkington Laminated Safety Glass.

A wide range of glass combinations and a choice of clear, translucent and coloured interlayers are available with laminated glasses. Please refer to Pilkington Architectural for advice.

In line with regulations applicable in many European countries, Pilkington recommend the use of laminated glass in overhead or sloping overhead glazing.

## 905 Fitting to Double Glazed Pilkington **Planar**™ Laminated IGUs.



## Specification – Pilkington **Planar**™ Laminated IGUs

### Composition

Pilkington **Planar**™ Laminated IGUs are manufactured from an outer pane of Pilkington T glass Plus and one laminated inner glass comprising of 4mm, 6mm or 8mm glasses. The use of heat strengthened or toughened glass in the laminate is dependent on the exact interlayer specification.

### Pilkington **Planar**™ Laminated IGUs

|  |                  |           |
|--|------------------|-----------|
| Air space:                                 | 16mm             | ±1mm      |
| Depth of silicone seal:                    | Minimum 4mm      |           |
| Aluminium spacer depth:                    | 7mm              |           |
| Sight line of unit edge seal:              | 12mm min.        | 20mm max. |
| Spacer colour:                             | Black or Natural |           |
| Laminated interlayer:                      | 1.52mm or 2.28mm |           |
| There may be a step on each side up to 3mm |                  |           |
| Overall thickness:                         | ±2mm tolerance   |           |

### Glass size – rectangles

|   |                               |           |
|---|-------------------------------|-----------|
| Maximum (4mm):  | 2000 x 3000mm                 | 0 + 4.5mm |
| Maximum (6-19mm):   | 2000 x 3600mm                 | 0 + 4.5mm |
|   | (Larger sizes upon request)   |           |
| Minimum:  | 300 x 500mm                   | 0 + 4.5mm |
| Aspect ratio:   | 14:1 Maximum for larger sizes |           |
| Larger glass sizes and weights greater than 350kg subject to enquiry. |                               |           |

### Shape capability

Rectangles and simple shapes. All tolerances will vary depending on the complexity of shape.

### Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or chips at edges will be ground out prior to toughening and do not constitute reason for rejection. Corners may be dubbed. Some variation in edgework may be discernible on exposed edges where different machines and/or hand forming is a requirement for manufacture. Such variations shall be kept to a minimum. Where the detail of a structure is such that the double glazing edge sealant is fully exposed, minor undulations in the edge seal may be discernible particularly near corners of the unit.

### Hole drilling – rectangles

|                       |  |
|-----------------------|--|
| Diameter:             | 34mm ±1mm  |
| Diameter:             | 19mm ±1mm Countersunk  |
| Position:             | Normally 60mm from glass edge at corners and sometimes along edge. Other configurations subject to confirmation. |
| Positional Tolerance: | ±2mm from one datum point  |
| Number of holes:      | Up to 8  |

### Interlayers available as standard

SentryGlas® or PVB.

### Toughening Stress

|                      |  |
|----------------------|--|
| 10/12/15/19mm glass: | Pilkington T glass Plus (Toughened and Heat Soaked)  |
| 4/6/8mm glass:       | Heat Strengthened or toughened as required by design |

### Bow

|              |                             |
|--------------|-----------------------------|
| Maximum bow: | 0.15% (Float glass)         |
|              | 0.2% (Ceramic coated glass) |

### Roller wave

|   |        |
|---|--------|
| Mean roller wave depth:   | 0.05mm |
| Maximum edge dip:   | 0.25mm |
| Roller wave is usually parallel to the short side and in coated glass should be glazed horizontal where possible. |        |

### Glass marking

Glass will be marked with the Pilkington toughening stamp and will show compliance with other regulatory requirements. The mark will be on each glass pane. Multiple panes will not necessarily be marked in the same corner.

### Visual quality

#### Distortion

When laminating toughened or heat strengthened glasses together slight visible distortion in transmission due to the small lens effects will be noted with increase in viewing angle. The phenomenon is not normally a problem in roof glazing, but may be discernible in vertical glazing. The air in all sealed units expands and contracts in hot and cold weather causing the glass to bow out and in respectively and again reflections will reflect this movement. On occasion, such effects can be increased by the specification of a coated glass within the unit. Site inspection should be from a distance of 3m and at right angles to the glass.

#### Installation

Whilst the Pilkington **Planar**™ system is completely weatherproof, the components are not designed to be left in contact with water for extended periods, and adequate ventilation or drainage should be provided to allow the system to dry out periodically. Weatherseals used around the periphery must be compatible with the Pilkington **Planar**™ system and approval from Pilkington should be sought prior to application.

This publication gives a general description of the product and materials. It is the responsibility of the users of this document to ensure that the proposed application of the product is appropriate and that such application complies with all relevant local and national legislation, standards, codes of practice and other requirements. To the extent allowed by law, Pilkington United Kingdom Limited, hereby disclaims all liability howsoever arising from any error in or omission from this publication and all consequences of relying on it. For more information about Pilkington **Planar**™, please visit [www.pilkington.co.uk/planar](http://www.pilkington.co.uk/planar)



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# Pilkington Planar™ System Information

## Pilkington Planar™ Integral

Pilkington Planar™ Integral – Laminated Safety Glass  
Performance of typical combinations with clear interlayer

| Outer Heat Strengthened or Pilkington T glass Plus | Pilkington T glass Plus Inner Leaf | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m²K) | R <sub>w</sub> Value (dB) |
|--|------------------------------------|------------------------|----------------------|--|---------------------------|-----------------|---------------------------|
| Pilkington Optifloat™ Clear 4mm                    | Pilkington Optifloat™ Clear 10mm   | 0.83                   | 0.08                 | 0.69                                   | 0.79                      | 5.4             | 38                        |
| 4mm  | 12mm                               | 0.82                   | 0.08                 | 0.67                                   | 0.77                      | 5.4             | 39                        |
| 6mm  | 10mm                               | 0.82                   | 0.08                 | 0.68                                   | 0.78                      | 5.4             | 39                        |
| 6mm  | 12mm                               | 0.81                   | 0.07                 | 0.65                                   | 0.75                      | 5.3             | 39                        |
| Pilkington Optiwhite™ 4mm                          | Pilkington Optiwhite™ 10mm         | 0.89                   | 0.08                 | 0.82                                   | 0.94                      | 5.4             | 38                        |
| 4mm  | 12mm                               | 0.88                   | 0.08                 | 0.81                                   | 0.93                      | 5.4             | 39                        |
| 6mm  | 10mm                               | 0.88                   | 0.08                 | 0.81                                   | 0.93                      | 5.4             | 39                        |
| 6mm  | 12mm                               | 0.88                   | 0.08                 | 0.81                                   | 0.93                      | 5.3             | 39                        |
| Pilkington Activ™ Clear 6mm                        | Pilkington Optifloat™ Clear 10mm   | 0.77                   | 0.14                 | 0.64                                   | 0.74                      | 5.4             | 39                        |
| Pilkington Activ™ Blue 6mm                         | Pilkington Optifloat™ Clear 10mm   | 0.47                   | 0.12                 | 0.43                                   | 0.49                      | 5.4             | 39                        |

Technical data has been calculated according to EN 410 and EN 673. The above table has been updated to take into account the declared values of radiation and thermal properties required for CE Marking. R<sub>w</sub> Value is indicative for PVB interlayer product only and will be subject to minor variations dependent upon the size of the glass panels and the number of fittings required.

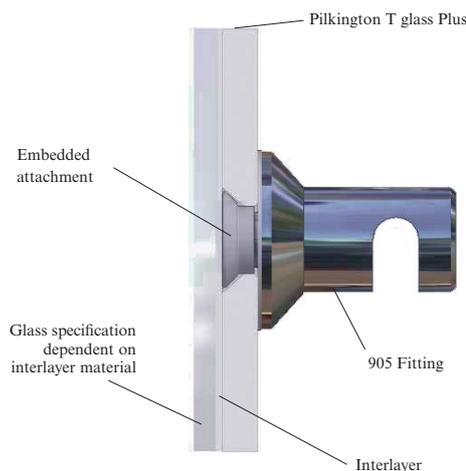
### Pilkington Planar™ Integral – Glass Types

| Glass Type   | Colour        | 4mm | 6mm | 10mm | 12mm | 15mm | 19mm | Notes  |
|--|---------------|-----|-----|------|------|------|------|--|
| Pilkington Optifloat™                              | Clear         | ✓   | ✓   | ✓    | ✓    | ✓    |      |  |
| Pilkington Optifloat™                              | Grey          | ✓   | ✓   | ✓    |      |      |      |  |
|  | Bronze        | ✓   | ✓   | ✓    |      |      |      |  |
|  | Green         | ✓   | ✓   | ✓    |      |      |      |  |
| Pilkington Optiwhite™                              | Clear         | ✓   | ✓   | ✓    | ✓    | ✓    |      |  |
| Pilkington Arctic Blue™                            | Blue          | ✓   | ✓   | ✓    |      |      |      |  |
| Pilkington K Glass™                                | Clear         | ✓   | ✓   |      |      |      |      |  |
| Pilkington Decorative Glass Screen Printed         |               | ✓   | ✓   | ✓    | ✓    | ✓    |      | Maximum screened area 2000 x 3600mm<br>(See enclosed data sheet for further details) |
| Pilkington Activ™ Clear and Pilkington Activ™ Blue | Clear<br>Blue |     | ✓   | ✓    | ✓    |      |      |  |

For Pilkington Texture Glass availability, please contact Pilkington Architectural.

### Pilkington Planar™ Integral

A fully tested and patented method of fixing laminated glass panels to a backup structure without any exterior bolts, caps or washers. All fixings are embedded within the laminated glass. This fixing system allows a much wider variety of glass types, including decorative and textured glass, to be used in a structural glass application. Integral allows us to horizontally glaze an entire roof or canopy without any fasteners in the exterior glass.



## Specification – Pilkington **Planar**<sup>™</sup> Integral

### Indicative Glass combinations

6mm or 4mm + 10mm (csk)  
6mm or 4mm + 12mm (csk)  
6mm or 4mm + 15mm (csk)

### Pilkington **Planar**<sup>™</sup> Laminated Safety Glass

Interlayer: 1.52mm or 2.28mm  
There may be a step on each side up to 3mm

### Glass size – rectangles

Maximum (4mm): 2000 x 3000mm 0 + 4mm  
Maximum (6-19mm): 2000 x 3600mm 0 + 4mm  
(Larger sizes upon request)  
Minimum: 300 x 500mm 0 + 4mm  
Aspect ratio: 14:1 Maximum

Larger glass sizes and weights greater than 350kg subject to enquiry.

### Shape capability

Rectangles and simple shapes. All tolerances will vary depending on the complexity of shape.

### Glass Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or chips at edges will be ground out prior to toughening and do not constitute reason for rejection. Corners may be dubbed. Some variation in edgework may be discernible on exposed edges where different machines and/or hand forming is a requirement for manufacture. Such variations shall be kept to a minimum.

### Hole drilling – rectangles

Diameter: 19mm ±1mm Countersunk  
Position: Normally 60mm from glass edge at corners and sometimes along edge. Other configurations subject to confirmation.  
Tolerance: ±2mm from one datum point  
Number: Up to 8

### Method of production

SentryGlas<sup>®</sup> or PVB.

### Toughening Stress

10/12/15mm glass: Pilkington T glass Plus  
(Toughened and Heat Soaked)  
4/6mm external glass: Heat Strengthened or Pilkington T glass Plus  
as required by design

### Bow

Maximum bow: 0.15% (Float glass)  
0.2% (Ceramic coated glass)

### Roller wave

Mean roller wave depth: 0.05mm  
Maximum edge dip: 0.25mm

Roller wave is usually parallel to the short side and in coated glass should be glazed horizontal where possible.

### Glass marking

Glass will be marked with the Pilkington toughening stamp and will show a compliance with other regulatory requirements. The mark to be on each glass usually near a corner.

Multiple panes will not necessarily be marked in the same corner.

### Visual quality

#### PVB

Advances in PVB technology in recent years have led to improved edge stability. Under natural exposure conditions the edge of a PVB laminate will be of an acceptable quality when properly installed and maintained. However the possibility of minor delamination cannot entirely be excluded. When viewed from a distance of 3m in transmission and in the vertical position, bubbles, dirt or fibres within the laminate will be considered to be unacceptable if readily visible due to their size or quantity.

#### SentryGlas<sup>®</sup>

The interlayer technology delivers increased load bearing characteristics and improved overall durability. Laminates with exposed edges shall not develop defects at edges (including holes) as characterised by the Edge Stability Number (ESN), great than a value of 200, with no defect extending greater than 3mm normal to the chamfered edge of the laminate. Laminates will conform to the specification for process blemishes set forth in ASTM C1172-03, Table 1. When viewed from a distance of 3m in transmission and in the vertical position, bubbles, dirt or fibres within the laminate will be considered to be unacceptable if readily visible due to their size or quantity.

#### Distortion

When laminating toughened or heat strengthened glasses together slight visible distortion in transmission due to the small lens effects will be noted with increase in viewing angle. The phenomenon is not normally a problem in roof glazing, but may be discernible in vertical glazing. On occasion such effects can be increased by the specification of a coated glass. Site inspection should be from a distance of 3m and viewed at right angles to the glass.

#### Installation

Whilst the Pilkington **Planar**<sup>™</sup> system is completely weatherproof, the components are not designed to be left in contact with water for extended periods, and adequate ventilation or drainage should be provided to allow the system to dry out periodically. Weatherseals used around the periphery must be compatible with the Pilkington **Planar**<sup>™</sup> system and approval from Pilkington should be sought prior to application.

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## Pilkington Planar™ System Information

### Pilkington Planar™ Triple

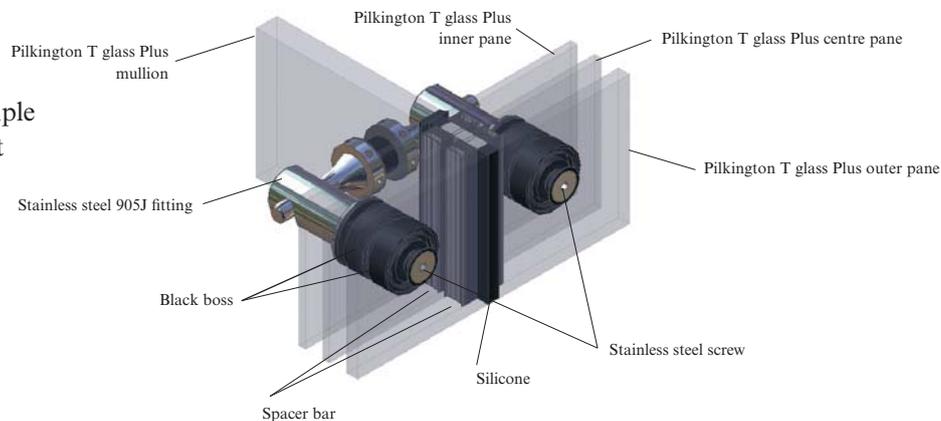
| Glass Type                                   |                                    |                                    | Light Transmittance LT | Light Reflectance LR | Total Solar Radiant Heat Transmittance | Total Shading Coefficient | U Value (W/m²K) |
|--|------------------------------------|------------------------------------|------------------------|----------------------|--|---------------------------|-----------------|
| Outer Pane 10mm                              | Centre Pane 6mm                    | Inner Pane 6mm                     |                        |                      |  |                           |                 |
| Pilkington <b>Optifloat™</b> Clear           | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.69                   | 0.19                 | 0.59                                   | 0.68                      | 1.8             |
| Pilkington <b>Optifloat™</b> Green           | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.53                   | 0.13                 | 0.34                                   | 0.39                      | 1.8             |
| Pilkington <b>Optiwhite™</b>                 | Pilkington <b>Optiwhite™</b>       | Pilkington <b>Optiwhite™</b>       | 0.76                   | 0.21                 | 0.74                                   | 0.85                      | 1.8             |
| Pilkington <b>Arctic Blue™</b>               | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.31                   | 0.07                 | 0.25                                   | 0.29                      | 1.8             |
| Pilkington <b>Optifloat™</b> Clear           | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.64                   | 0.21                 | 0.55                                   | 0.63                      | 1.3             |
| Pilkington <b>Optifloat™</b> Green           | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.49                   | 0.14                 | 0.31                                   | 0.36                      | 1.3             |
| Pilkington <b>Optiwhite™</b>                 | Pilkington <b>Optiwhite™</b>       | Pilkington <b>K Glass™</b> (5)     | 0.68                   | 0.23                 | 0.70                                   | 0.80                      | 1.3             |
| Pilkington <b>Arctic Blue™</b>               | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.28                   | 0.08                 | 0.22                                   | 0.25                      | 1.3             |
| *Pilkington <b>Activ™</b> Clear ( <i>l</i> ) | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.60                   | 0.25                 | 0.53                                   | 0.61                      | 1.3             |
| *Pilkington <b>Activ™</b> Blue ( <i>l</i> )  | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.26                   | 0.09                 | 0.20                                   | 0.23                      | 1.3             |
| *Planar Sun 66/33 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.57                   | 0.18                 | 0.32                                   | 0.37                      | 1.0             |
| *Planar Sun 73/39 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.62                   | 0.14                 | 0.37                                   | 0.43                      | 1.1             |
| *Planar Sun 68/34 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.58                   | 0.13                 | 0.33                                   | 0.38                      | 1.0             |
| *Planar Sun 70/36 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.60                   | 0.15                 | 0.34                                   | 0.39                      | 1.0             |
| *Planar Sun 52/29 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.45                   | 0.11                 | 0.27                                   | 0.31                      | 1.1             |
| *Planar Sun 50/25 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>Optifloat™</b> Clear | 0.42                   | 0.11                 | 0.24                                   | 0.28                      | 1.0             |
| *Planar Sun 66/33 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.52                   | 0.20                 | 0.30                                   | 0.34                      | 0.8             |
| *Planar Sun 73/39 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.57                   | 0.16                 | 0.35                                   | 0.40                      | 0.9             |
| *Planar Sun 68/34 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.53                   | 0.14                 | 0.31                                   | 0.36                      | 0.8             |
| *Planar Sun 70/36 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.55                   | 0.17                 | 0.33                                   | 0.38                      | 0.8             |
| *Planar Sun 52/29 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.41                   | 0.12                 | 0.26                                   | 0.30                      | 0.9             |
| *Planar Sun 50/25 (2)                        | Pilkington <b>Optifloat™</b> Clear | Pilkington <b>K Glass™</b> (5)     | 0.39                   | 0.12                 | 0.22                                   | 0.25                      | 0.8             |

\*Please note that these are a selection of Solar Control glasses within the range and the performance data supplied is indicative only and can vary subject to the substrate used. Please check current availability of Planar Sun product range at [www.pilkington.com/planarcoatedupdate](http://www.pilkington.com/planarcoatedupdate) at the time of specification. Cavity for outer and centre pane = 16mm. Technical data has been calculated according to EN 410 and EN 673. The above table has been updated to take into account the declared values of radiation and thermal properties required for CE Marking. Please note: figures in brackets and italics indicate coated surfaces.

### Pilkington Planar™ Triple Units – Glass Types

| Glass Type   | Colour        | 4mm | 6mm | 8mm | 10mm | 12mm | 15mm | 19mm | Notes  |
|--|---------------|-----|-----|-----|------|------|------|------|--|
| Pilkington <b>Optifloat™</b>                                     | Clear         | ✓   | ✓   | ✓   | ✓    | ✓    | ✓    | ✓    |  |
| Pilkington <b>Optifloat™</b>                                     | Grey          | ✓   | ✓   |     | ✓    |      |      |      |  |
|  | Bronze        | ✓   | ✓   |     | ✓    |      |      |      |  |
|  | Green         | ✓   | ✓   |     | ✓    |      |      |      |  |
| Pilkington <b>Optiwhite™</b>                                     | Clear         | ✓   | ✓   |     | ✓    | ✓    | ✓    | ✓    |  |
| Pilkington <b>Arctic Blue™</b>                                   | Blue          |     | ✓   |     | ✓    |      |      |      |  |
| Pilkington <b>K Glass™</b>                                       | Clear         | ✓   | ✓   |     |      |      |      |      |  |
| Pilkington <b>Optitherm™</b> SN                                  | Clear         |     |     | ✓   |      |      |      |      | <i>Subject to minimum quantity. Max. size 2400 x 4800mm</i>                              |
| Planar Sun   |               |     | ✓   |     | ✓    |      |      |      | <i>Subject to minimum quantity. Max. size 2400 x 4800mm</i>                              |
| Pilkington Decorative Glass Screen Printed                       |               | ✓   | ✓   | ✓   | ✓    | ✓    | ✓    | ✓    | <i>Maximum screened area 2400 x 4500mm (See enclosed data sheet for further details)</i> |
| Pilkington <b>Activ™</b> Clear and Pilkington <b>Activ™</b> Blue | Clear<br>Blue |     | ✓   |     | ✓    |      |      |      |  |

## View of Pilkington **Planar**™ Triple unit with glass mullion support



## Specification – Pilkington **Planar**™ Triple Units

### Composition

Pilkington **Planar**™ Triple Units are manufactured from three panes of fully toughened and heat soaked glass (Pilkington T glass Plus) and reference should be made to the Single Pilkington **Planar**™ specifications for technical data which is not contained herein.

### Outer Pane

Outer pane to conform to single Pilkington **Planar**™ specifications.

### Centre/Inner Panes

|            |             |        |
|------------|-------------|--------|
| Thickness: | 4, 6mm      | ±0.2mm |
|            | 8, 10, 12mm | ±0.3mm |

### Pilkington **Planar**™ Triple Units

|                              |                     |      |
|------------------------------|---------------------|------|
| Airspaces:                   | 16mm                | ±1mm |
| Depth of silicone seal:      | Minimum 4mm         |      |
| Aluminium spacer depth:      | 7mm                 |      |
| Sightline of unit edge seal: | 12mm min. 20mm max. |      |
| Spacer colour:               | Black or Natural    |      |

### Glass size – rectangles

|                      |               |                        |
|----------------------|---------------|------------------------|
| Maximum:             | 2400 x 4800mm | 0 + 4.5mm              |
| Minimum:             | 300 x 500mm   | 0 + 4.5mm              |
| Aspect ratio:        | 14:1 Maximum  |                        |
| Diagonal tolerances: | Up to 4m:     | 3mm Maximum difference |
|                      | Over 4m:      | 4mm Maximum difference |
| Overall thickness    | 80mm Maximum  |                        |
| Maximum weight       | 600kg         |                        |

### Shape capability

Rectangles and simple shapes. All tolerances will vary depending on the complexity of shape.

### Roller wave – all glasses in same direction

|   |        |
|---|--------|
| Standard mean roller wave depth:  | 0.02mm |
| Planar Sun and Pilkington <b>Optitherm</b> ™ SN mean roller wave depth: | 0.05mm |
| Maximum edge dip:   | 0.25mm |

Roller wave is usually parallel to the short side and in coated glasses should be glazed horizontally where possible.

### Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or chips at edges will be ground out prior to toughening and do not constitute reason for rejection. Corners may be dubbed. Some variation in edgework may be discernible on exposed edges where different machines and/or hand forming is a requirement for manufacture. Such variations shall be kept to a minimum.

Where the detail of a structure is such that the glazing edge sealant is fully exposed, minor undulations in the edge seal may be discernible particularly near corners of the unit.

### Hole drilling – rectangles

|            |  |                  |
|------------|--|------------------|
| Diameter:  | 34mm   | ±1mm             |
| Diameter:  | 19mm   | ±1mm Countersunk |
| Position:  | Normally 60mm from glass edge at corners and sometimes along edge. Other configurations subject to confirmation. |                  |
| Tolerance: | ±2mm from one datum point.   |                  |
| Number:    | Up to 10   |                  |

### Toughening stress

Thermally toughened soda lime silicate safety glass to BSEN 12150-1. Classified as 1 (C) 1 to BSEN 12600. Checked regularly during production by fracture count or the Differential Stress Refractometer (DSR) method.

### Heat Soak Testing

All toughened glass will be supplied heat soaked to or in excess of international specifications eg EN 14179-1.

### Glass marking

Glass will be marked with the Pilkington toughening stamp and will show compliance with regulatory requirements. The mark will be on each glass pane. Multiple panes will not necessarily be marked in the same corner.

### Visual quality

#### Distortion

Pilkington **Planar**™ Triple Units are manufactured from three panes of toughened glass which has minimal effect on visual transmission through the glass but some distortion can be seen in reflection. The air in all sealed units expands and contracts in hot and cold weather causing the glass to bow out and in respectively and again reflections will reflect this movement. On occasion such effects can be increased by the specification of a coated glass. Site inspection should be from a distance of 3m and at right angles to the glass.

#### Installation

Whilst the Pilkington **Planar**™ system is completely weatherproof, the components are not designed to be left in contact with water for extended periods, and adequate ventilation or drainage should be provided to allow the system to dry out periodically. Weatherseals used around the periphery must be compatible with the Pilkington **Planar**™ system and approval from Pilkington should be sought prior to application.

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# Pilkington **Planar**™ System Information

## Screen Printed Glass from the Pilkington Decorative Glass Range



AMC THEATRE, California, USA. (Non-standard screen printed design)

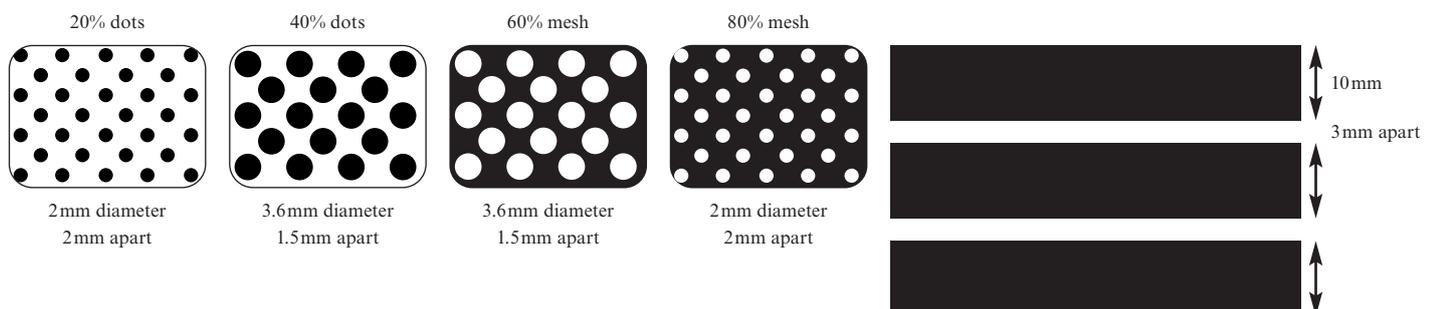
### Introduction

Screen printed glass is one of the decorative products from within the Pilkington Decorative Glass range. It is ideal for use in partitions, roof glazing and external walls where a combination of aesthetic and functional needs are required.

The major benefits are:

- Control of solar heat and light transmission
- Privacy
- Flexibility of designs – standard or commissioned
- Available in Pilkington **Planar**™ single, double or triple glazed and laminated options
- Available in a range of colours
- No colour fading

### Standard Designs



### Flat glass size

|                        |               |
|------------------------|---------------|
| Maximum                | 2400 x 4800mm |
| Maximum print coverage | 2400 x 4500mm |
| Minimum size           | 360 x 500mm   |

### Designs

Pilkington Architectural offer a range of standard designs as listed below. However, the inherent nature of the product encourages the use of bespoke designs. All bespoke designs should be submitted for discussion prior to placing an order to ensure that all design, colour and cost implications have been fully considered.

A non-standard design can be provided if:

- Minimum distance apart and width of lines is 3mm
- Minimum diameter of dot or hole is 2mm
- Minimum distance between dots or holes is 1.5mm

### Colours

WHITE ceramic ink is the most commonly used colour, though there are two other standard colours available:

BLACK and DIFFUSED (simulated Acid Etch).

For non-standard colour availability, please contact Pilkington Architectural.

*The range is limited to one colour per glass.*

### Screens

In order to maintain a consistent appearance, each glass size requires its own screen. Because of this, a minimum order level of 20 panes per size is normally required. However, smaller quantities can be ordered at increased costs.

The screens must be paid for by the clients as part of the contract and after completion of the contract screens will be kept for a period of six months and then offered to the client before disposal, thus it may be beneficial to order spare panes.

### Performance

The use of screen printed glass gives both aesthetic and technical control of heat and light transmission. By increasing the ceramic coverage on the glass, the shading coefficient of clear and body tinted glasses is reduced, thus allowing greater flexibility of choice and design.

Performance data for screen printed glass is available on request.

# Silk Screen Printed Glass Quality Specification

## Flat glass

|              |          |        |
|--------------|----------|--------|
| Thicknesses: | 10, 12mm | ±0.3mm |
|              | 15mm     | ±0.5mm |
|              | 19mm     | ±1.0mm |

Print Pattern Position: ±3mm

## Flat glass size – rectangles

|                     |               |                        |
|---------------------|---------------|------------------------|
| Maximum:            | 2400 x 4800mm | ±1mm                   |
| Minimum:            | 360 x 500mm   | ±1mm                   |
| Aspect ratio:       | 14:1          | Maximum                |
| Diagonal tolerance: | Up to 4m:     | 3mm Maximum difference |
|                     | Over 4m:      | 4mm Maximum difference |

## Flat shape capability – simple shapes

All tolerances will vary depending on the complexity of shape.

## Bow

Maximum bow: 0.2% (Ceramic coated glass)

## Roller wave

Mean roller wave depth: 0.02mm

Maximum edge dip: 0.25mm

Roller wave is usually parallel to the short side and in coated glass should be glazed horizontal where possible.

## Edge condition

Smooth ground edges giving a flat profile with small ground arris. Shells or chips at edges will be ground out prior to toughening and do not constitute reason for rejection. Corners may be dubbed. Some variation in edgework may be discernible on exposed edges where different machines and/or hand forming is a requirement for manufacture. Such variations shall be kept to a minimum.

## Hole drilling – rectangles

Diameter: 19mm ±1mm (countersunk)

Position: Normally 60mm from glass edge at corners and sometimes along edge. Other configurations subject to confirmation.

Tolerance: ±2mm from one datum point.

Number: Up to 10

## Toughening stress

Thermally toughened soda lime silicate safety glass to EN 12150. Classified as 1 (C) 1 to BSEN 12600. Checked regularly during production by fracture count or the Differential Stress Refractometer (DSR) method.

## Heat soak testing

All toughened glass will be supplied heat soaked to or in excess of international specifications (eg EN 14179-1)

## Visual quality

Roller wave and natural bow in toughened glass have minimal effect on vision in transmission but can be observed in reflection, obviously more with reflective glass. This is kept to a minimum with the very low roller wave and bow in Pilkington T glass Plus.

Site inspection should be from a distance of 3m and viewed at right angles to the glass.

## Installation

Whilst the Pilkington **Planar**™ system is completely weatherproof, the components are not designed to be left in contact with water for extended periods, and adequate ventilation or drainage should be provided to allow the system to dry out periodically.

Weatherseals used around the periphery must be compatible with the Pilkington **Planar**™ system and approval from Pilkington should be sought prior to application.

## Printing

Screen printed glass is produced to a high standard, although the inherent nature of the products and processes are such that they may give minor imperfections such as pin holes, small print misses, small variations, etc. In order to establish an acceptable visual standard the glass should be inspected from a distance of 3m, and at right angles to the glass.

## Colour variation

The colour of the print will be modified by the glass tint

(when viewed from glass side).

Different glass thicknesses will modify the same print by different amounts (when viewed from glass side).

Slight colour variations can occur from variations in ink batches and tempering conditions.

## Opacity

With lighter colours, dark objects in close/intimate contact with printed surface may 'show through,' i.e. adhesives/insulation, etc.

'All over' solid colours are generally not suitable for use in transmitted light situations where pin holes, linear marks from the directional nature of the process will be visible.

'All over' simulated acid etch is a more 'translucent' finish, which tends to reduce the effects of pin holes, print misses and linear marks from the process, although they may still be visible.

Patterns either all over or partial tend to reduce the effects of pin holes, print misses and linear marks from the process, although they may still be visible.

## Pattern

During the elevated temperatures of the tempering process, the medium in which the glass powder and colourants are suspended is 'driven off.' Some slight shrinkage may occur at the edge of the pattern, which may result in some minor loss of definition.

With screen print dimensions greater than 1200 mm wide, a joint may be necessary in the screen. This may be apparent on the finished product.

A clear border of 12 mm is recommended around the edge of each printed panel.

Pin holes, small print misses and spot faults may be present in the product, the application will determine to a considerable extent whether the features are more or less obtrusive:

Fine scratches and scars barely perceptible from 3 m shall be deemed acceptable, white handling scars, shall be deemed rejectable.

## Simulated Acid Etch Finish

The acid etch finish exhibits, what can best be described as, a porous surface and contamination can be difficult to remove. It is recommended that appropriate preventative action is taken, particularly on construction sites.

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