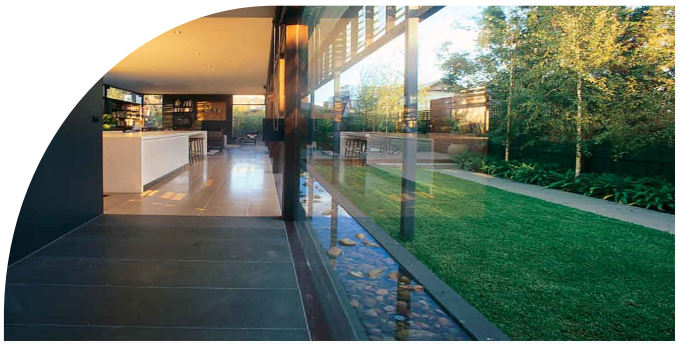
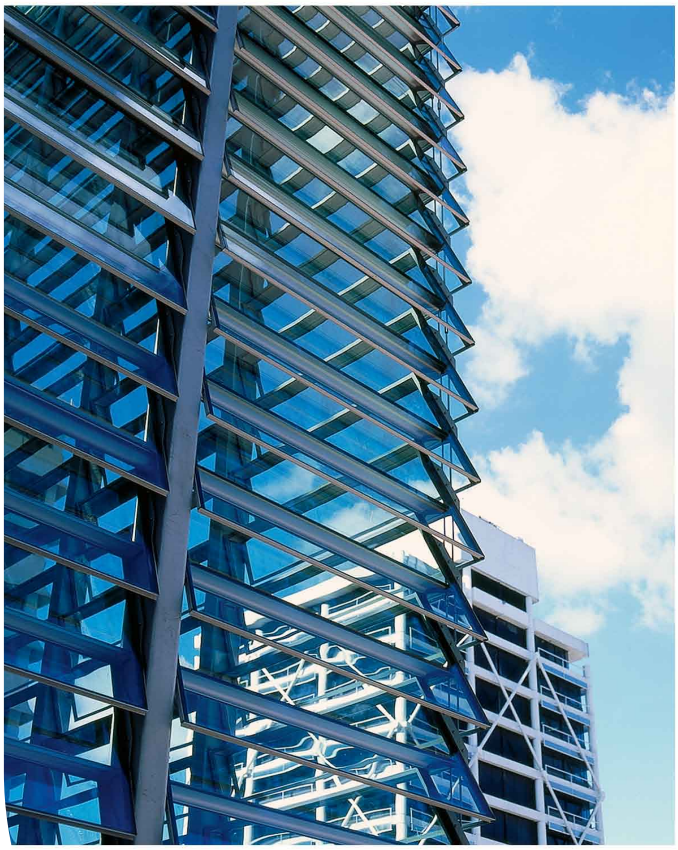





Pilkington Architectural Product Guide 2008

PILKINGTON

NSG Group Flat Glass Business


Technology
Innovation
Environment

Table of Contents

Company Overview

As a leading global glass manufacturer, Pilkington provides the broadest range of glass products available in the world today. Continuous product innovation ensures the development of the most appropriate products for North America and the global marketplace. Glass plays a significant role in reducing energy consumption and greenhouse gas emissions. Glass also helps control the flow of heat, UV rays, and glare while letting light into a building, increasing the overall comfort and productivity of its occupants. Pilkington is committed to being at the forefront of these developments.

Pilkington – First in Glass™

The selection of glass products has become more complex since Pilkington invented the float glass process in 1952. The property of glass has become increasingly multifaceted with the ability to perform a wide variety of functions. The key to these developments has been glass's unique attributes of transmitting daylight and mediating the environment to provide a better place in which to live and work.

Glass Manufacturing

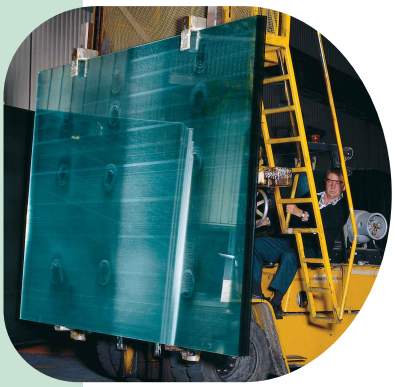
Float Glass

The float glass process was invented by Pilkington and sets the world standard for the production of high quality glass. It is manufactured by melting sand, soda ash, dolomite and limestone together and produces a continuous 12-foot wide glass ribbon. The molten glass flows from the furnace and "floats" over a bed of molten tin. It is then carefully cooled to anneal the glass – a process that minimizes the internal stresses enabling it to be cut.

The Pilkington float glass process is renowned for flatness and optical clarity. The glass product is available in clear, tinted, high performance tinted, ultra-clear low iron and textured glass.

Coated Glass

On-line pyrolytic hard coatings are produced by depositing microscopically thin layers of metallic oxides by the chemical vapor deposition process during float glass manufacturing. This process produces extremely durable coated products that can easily be handled, transported and processed. These products typically combine low emissivity, solar control, and can also provide a wide range of properties from low reflection to self-cleaning. Pilkington is the industry leader in pyrolytic coating technology.



Glass Fabrication

Insulating Glass Units
Insulating units are two or more panels of glass bonded to a perimeter spacer material with a hermetically sealed airspace. The primary benefit is insulation and solar control. Most types of glass can be incorporated into an insulating glass unit.

Laminated Safety Glass
Comprises two or more layers of glass bonded together with a plastic or resin interlayer. If broken, the interlayer is designed to hold the glass together. Virtually all glass types can be laminated and the thickness and types of interlayer can be varied to provide ballistic, bomb or physical attack resistance. Laminated glass can typically be cut and further processed.

Tempered Glass
Tempered (toughened) glass is at least four or more times stronger than annealed glass. When broken, it shatters into many small fragments which prevent major injuries. This type of glass is intended for glass façades, sliding doors, building entrances, bath and shower enclosures, and other uses requiring superior strength and safety properties.

On rare occasions, heat-treated (tempered and sometimes even heat-strengthened) glass can break spontaneously, without any applied load, due to small inclusions that may be present in all float glasses. Please refer to ATS Bulletin 165 for more information.

Heat Strengthened
Annealed glass is subjected to a special heat-treatment in which it is heated to about 680°C and afterwards cooled. If it is cooled more slowly then tempered glass, the glass is twice as strong as annealed glass, and the fragments of the broken glass are larger and more likely to remain in the frame. Heat strengthened glass is not recognized as a “safety glass” by the building codes.

Selecting the Right Glass

Glass plays a unique and important role in building design and the environment. It affects design, appearance, thermal performance and occupant comfort. The selection of the right glass is a crucial component of the design process.

By identifying key issues at the design stage, glass products can be selected to match your specific application. Pilkington sales managers and engineers are available for specific project questions and issues at any critical design phase as well as throughout the entire project.

Product Selection and Application
Pilkington products are categorized by their primary application so that it is easy to find and compare products. Each category is identified by a symbol/icon representing the application. Many glass products are multi-purpose or can be manufactured to perform many functions.

Specifying
Some key factors need to be considered in the selection of glass in facades, interiors and glass systems. Solar and thermal performance will often be a high priority decision along with appearance (color, transparency and reflectivity). This information will lead to a glass product type with additional attributes such as safety, security, decoration, noise control and self cleaning.

Breakage and Risk Considerations
How glass behaves in the case of accidental or intentional breakage must be considered, and while glazing codes and regulations provide the minimum requirements, they do not necessarily constitute fitness for purpose.

Technical Bulletins
Technical Bulletins (ATS) are additional tools that have been developed to assist you in all aspects of specifying Pilkington glass. These bulletins will be referenced in the margins throughout this brochure and can be downloaded from our website.

Not All Energy is the Same
To understand how revolutionary Pilkington products really are, you need to know a little bit about energy and heat as it applies to glass.

- Heat gain comes from both the sun's direct short-wave radiation and the transfer of energy from the exterior environment.

- Solar Control refers to the ability of a glass to resist heat flow from the sun's direct radiation, including the short-wave infrared energy that lies near visible light in the spectrum. Tinted or coated glass provides Solar Control by absorbing or reflecting a portion of the sun's energy. The solar heat gain coefficient (SHGC) represents a ratio of the solar heat gain through the glass relative to the solar radiation shining onto the glass.

- Glass can provide Solar Control by either absorbing a portion of this energy (such as tinted glass) or reflecting a portion of it (reflective glass). In the case of Pilkington **Eclipse Advantage™** Solar Control Low-E Glass, there is a combination of the two. Coated glass can also provide solar control, as well as reducing the emittance of far-infrared absorbed heat energy inward due to its low-emissivity coating.

- Thermal Control refers to the insulating value of the glass – its ability to resist the transfer of heat from the warmer to the cooler side by conduction, convection and thermal radiation.

- Low-E glass provides these Thermal Control properties, and its insulating ability is measured by its U-Factor.

Pilkington **Eclipse Advantage™** Solar Control Low-E and **Solar-E™** Solar Control Low-E Glass provide both Solar and Thermal Control in a single glass, while the color neutrality of Pilkington **Energy Advantage™** Low-E Glass means you can combine it in an insulating glass unit with a selection of other glass, including high performance tints, to provide additional solar control.

The result is an almost limitless number of aesthetic and performance options.

Technical Bulletins

ATS 104
Protecting Glass

ATS 112
Preventing Stain

ATS 113
Applied Plastic Films

ATS 114
Butt Joint Edges

ATS 116
Glass & Energy

ATS 122
Glass Selection

ATS 124
Spandrel Panels

ATS 126
Lawn Sprinklers

ATS 141
Fading Control

Coating Technology and LEED

The Pilkington Pyrolytic Advantage
Whether you select Pilkington **Eclipse Advantage™** Solar Control Low-E, **Solar-E™** Solar Control Low-E or **Energy Advantage™** Low-E Glass, you'll have the benefits of Pilkington patented pyrolytic technology and the very practical advantages that it brings to every project.

Most Low-E glass is produced by applying a special coating to sheets of finished glass in a process called sputter coating. These "soft coat" products have some limitations. The coating can be scratched or damaged, and can potentially deteriorate with exposure to air, giving the product a limited shelf life. Much of the fabrication process, including bending and tempering, must often be done before the glass is coated. Edge deletion is usually recommended for soft coat insulating glass units.

But Pilkington Low-E glass products are produced by a patented pyrolitic process that exposes hot glass to chemical vapors during the actual float glass production, where they bond to the glass on the molecular level.

Having a hard "pyrolytic" surface fired on at over 1200°F, pyrolytic products are durable, bendable and post-temperable. In addition because the pyrolytic surface doesn't degrade like a sputtered coating, it can be warehoused locally for availability, reducing project lead times across the country and around the world.

Pilkington LEEDing the Way
Pilkington has been proud to be the technological leader in glass manufacturing for many years. Whether it's improving processes such as the float glass manufacturing; which produces more than 95 percent of glass worldwide, advancing coating technologies (pyrolytic or "hard-coat" coatings that require significantly less energy to make), or our wide range of Solar and Thermal Control glass products, Pilkington is proud to lead in areas of environmental concern, sustainability and green building initiatives.

One of the most recognized architectural standard in green or sustainable building design is the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ administered by the United States Green Building Council (USGBC). LEED was developed to define "building green" by establishing a common standard of measurement and recognize environmental leadership in the building industry. The certification process for buildings is based on a point system.

While LEED does not certify specific building products (glass), it does recognize the benefit glass products play in fulfilling LEED point requirements. Pilkington products can help architects achieve LEED certification for their projects in a number of areas such as energy performance, regional materials, daylight and views.

Contact Pilkington for information regarding products that can help you achieve your LEED certification.

Energy Management

Energy management is a key decision in determining the performance and appearance of the building envelope. This section outlines the various attributes and performances of Pilkington glass.

Visible Light Transmittance
The percentage of visible light transmitted through the glass. The higher the number, the greater the amount of light that passes though the glass. It does not determine the color of the glass.

SHCG (solar heat gain coefficient)
A combination of the directly transmitted solar and radiant energy and the proportion of the absorbed solar energy that enters into the building's interior. The lower the number the greater the solar control.

U-Factor (U-Value)
This is the measurement of air-to-air thermal conductance or insulation between indoors and outdoors through the glass. The lower the number the better the insulation or thermal control.

Low-E Glass
These coated glasses provide thermal control and enhanced insulation as well as additional solar control when combined with a solar control glass in either a single glass or insulating glass unit. Low-E coatings reduce the emissivity of the glass surface. This means the glass provides greater insulation by reflecting heat generated from heating and other sources back inside a building. A second line of defense is improved solar control. Heat absorbed by the solar control glass is driven back out by the low emissivity coating to provide even better solar and thermal control. Low-E coatings are useful for reducing solar heat gains and heat loss.

Performance Comparison
To assist in comparing products, Pilkington has developed tables of performance values: visible light, solar control and insulation (tables can be found in the back of this product guide).

Pilkington Advanced-Technology Glass Products

Since developing the float glass process by which virtually all modern glass is produced, Pilkington has been a global leader in advanced glass technology.

Today, Pilkington utilizes an international network of research, distribution, fabrication and support facilities to bring you a wide range of glass products to meet both your performance and aesthetic requirements; practically, efficiently and cost-effectively.

At the heart of Pilkington's advanced technology is our patented pyrolytic process, to create:

- Pilkington **Eclipse Advantage™** Glass – the world's first pyrolytic solar control Low-E glass – combining the thermal and solar control properties that today's buildings demand with high visible light transmittance, subtle reflectivity, glare control and crisp, consistent color that today's designs deserve.

- Pilkington **Energy Advantage™** Low-E Glass – provides excellent thermal performance with a color-neutral appearance.

- Pilkington **Solar-E™** Solar Control Low-E Glass – joining both solar and thermal performance in a single, practical solution.

- Pilkington **Activ™** Self-Cleaning Glass – the world's first solar-powered glass using energy from the sun, in combination with water, to remove dirt and grime.

- Pilkington **OptiView™** Anti-Reflective Glass – combines two proprietary pyrolytic surfaces in a single laminated glass to minimize visible light reflectance to less than 2 percent, while allowing more visible light to pass through than even clear float glass.

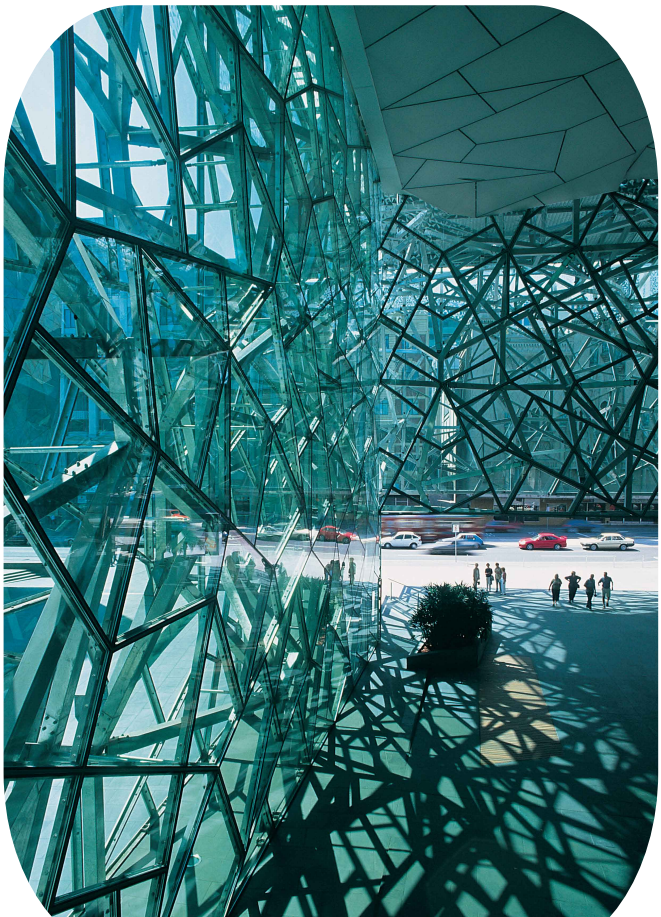
- Pilkington **TEC™** Glass – a durable, color neutral pyrolytic electrically conductive coated glass for various applications including: thin film photovoltaics, electrochromics, touch screens, static control and heated glass for commercial refrigeration and other applications.

These Pilkington products can be stored, handled, fabricated, tempered and even bent just like ordinary glass without sacrificing the consistent aesthetics that a pyrolytic product gives.

Pilkington also offers a selection of both standard and high performance tinted float glasses that, in addition to clear glass, can all be combined with an inboard lite of Pilkington **Energy Advantage™** Low-E Glass, to create an almost limitless range of aesthetic and performance options.

So with all of these different glazing options, how do you find the product or combination of products that's exactly right for your project?

We've made that easy too, because we've put all this power at the tip of your finger at **www.pilkington.com**, your #1 source for glass and glazing information!



Pilkington Sun Management Web Site (Specifications)

Pilkington Product Selection Calculator
Compare different glass and glazing options. Combine different inboard and outboard lites. Then the interactive Pilkington Product Selection Calculator will generate all the relevant performance numbers for you, in simple, easy-to-follow tables that you can print for future reference.

Custom Glass Specification
Once you've found the perfect glazing combination for your project, the Pilkington **Sun Management™** Calculator will generate a custom glass specification for you, ready to copy and paste right into your project documents.

You can choose between a comprehensive, three-part CSI format specification, a short outline specification and glazing chart, or just drawing notes with a glazing chart.

No matter which format is right for you, the Pilkington **Sun Management™** Calculator makes it as easy as 1-2-3.

Thermal Stress Calculator
Not sure when you need to heat treat different kinds of glass under different conditions? Then the interactive Pilkington Thermal Stress Calculator will help you determine that, too.

Just answer a few simple questions, and the Pilkington Thermal Stress Calculator will do all the hard work for you.

Wind Load Calculator
We're even including an online Wind Load Calculator that lets you quickly check your design against ASTM E1300 Standard Practice for Determining Load Resistance of glass and buildings.

Project Gallery
Spend some time in the project gallery and see for yourself how architects worldwide are harnessing the power of the Pilkington glass products in unique and innovative ways with the Pilkington Project Gallery and Case Studies.

Pilkington Online Library
Take time to browse the Pilkington online library where you'll find a wealth of resources, including the latest up-to-the-minute information on all our products.

- The full Pilkington Architectural Glass Product guide, including comprehensive product performance information, technical data and product applications.
- Brochures and data sheets for specific products.
- An extensive selection of Pilkington Architectural Technical Bulletins.

At www.pilkington.com, you will also find a wealth of resources, including:

- Comprehensive product performance data.
- Answers to frequently asked questions about glass and glazing.
- Technical data including physical properties of glass for load and design purposes as well as maximum size availability for annealed glass.
- And even a number of online, interactive tools that can help you do your job better and faster!

Visit www.pilkington.com/na for more information.

The world's first family of Solar Control Low-E glass.

Pilkington **Eclipse Advantage™** Solar Control Low-E Glass

Now You Can Dream in Color Again
Major advances in glass technology, such as Low-E and solar control glass, have revolutionized the applications met by glass today. However, there have still been limitations on available products offering a combination of these properties together with a variety of color ranges to meet individual requirements.

Pilkington **Eclipse Advantage™** is the next generation of coated energy management glass and is the world's first pyrolytic Low-E glass. It is designed for buildings that require both solar control performance and the insulating benefits of a Low-E coating.

Description
Pilkington **Eclipse Advantage™** is manufactured by the Pilkington pyrolytic process. In this on-line chemical vapor deposition process, a gas reacts with the semi-molten surface of the float glass to form a subtle reflective coating on clear and tinted glass. The result is a product that combines solar and thermal performance, subtle reflectivity and glare control.

The base color of the glass whether clear, grey, bronze, blue green, Pilkington **EverGreen™**, Pilkington **Arctic Blue™** or the new Gold **Eclipse Advantage™** is enhanced along with a significant boost to solar and thermal characteristics through the proprietary Low-E coating.

Product Selection
Pilkington **Eclipse Advantage™** Low-E coating provides thermal and solar control enhancements. The wide range of color options provide designers the ability to design with color while maximizing performance.

Vision Area Coating Quality Specifications
When viewing Pilkington **Eclipse Advantage™** Glass with a bright, uniform background, coating quality specifications apply to vision areas as stated in ASTM C 1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.

Technical Bulletins

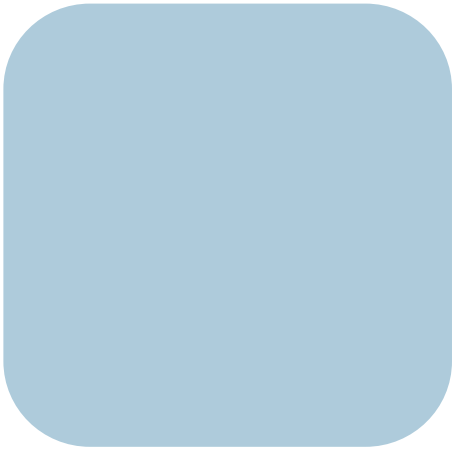
ASTM 1376
Coated Glass Standards

ATS 123
Thermal Stress

ATS 124
Spandrel Panel Glazing

ATS 176
Handling, Inspecting, Fabricating & Glazing Pilkington Eclipse Advantage™

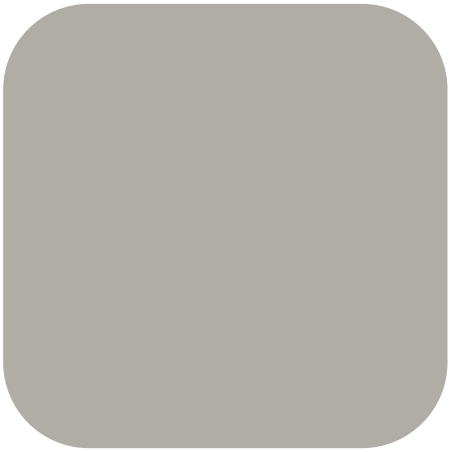
Pilkington **Eclipse Advantage™** Solar Control Low-E Glass



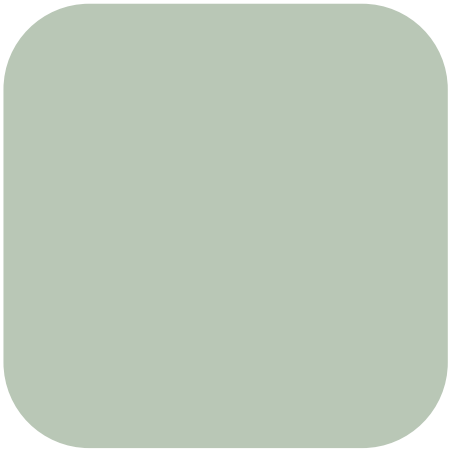
Eclipse Advantage™ Arctic Blue

Eclipse Advantage™ Blue-Green

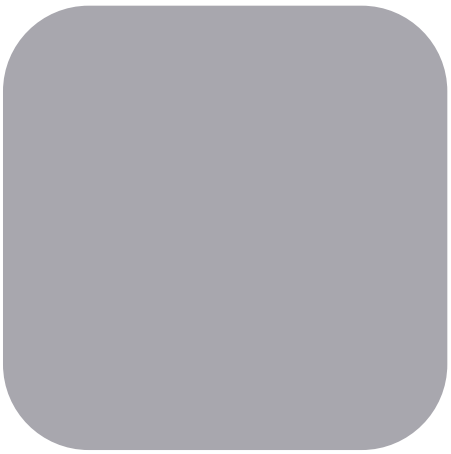
Eclipse Advantage™ Clear



Eclipse Advantage™ Bronze



Eclipse Advantage™ Evergreen



Eclipse Advantage™ Grey

Pilkington **Eclipse Advantage™** Solar Control Low-E Glass

Features and Benefits

- Design Flexibility – Achieve a crisp, natural color with subtle reflectivity, high visible light transmittance and glare control.
- Higher Daylight Transmittance – Allows more natural light than former "mirror-like" reflective glass, with lower visible reflectance and solar control properties in a single pyrolytic surface.
- Durable Pyrolytic Surface – Pilkington **Eclipse Advantage™** Glass products can be handled, cut, insulated, laminated, heat-strengthened, tempered and bent using standard techniques.
- Lead Time Advantage – Due to the durable pyrolytic coating, Pilkington **Eclipse Advantage™** has excellent availability in all color options to be processed like ordinary glass, greatly reducing project lead times.
- Energy Efficient – Low-emissivity properties combined with solar control results in energy cost reductions compared to ordinary glass.
- Reduced UV Transmittance – Reducing the sun's damaging radiation lessens color fading and breakdown of plastic materials.
- Sealant Compatible – Compatible with most sealants and does not require edge deletion.
- Color and Surface Uniformity – Pilkington **Eclipse Advantage™** is aesthetically consistent for a great appearance.
- Low-E coating requires installation on the second surface for solar control.

Applications

- Commercial Buildings Requiring Solar and Thermal Control
- Low, Mid and Hi-Rise
- Medical/Hospital
- Educational/Schools
- Office
- Retail


Where high performance and
maximum transparency is required.

Pilkington **Solar-E™** Low-E Glass

Description

The world's first pyrolytic solar control Low-E glass, Pilkington **Solar-E™** Glass is the perfect solution for meeting cooling load requirements and other energy code programs.

Manufactured using a unique chemical vapor deposition method, Pilkington **Solar-E™** Glass features an integral pyrolytic surface which provides superior fabricating and handling qualities. As a result, the glass can be handled, cut and tempered, and offers unlimited shelf life. In addition, no edge deletion or special handling is required.

Features and Benefits

- Optimized Solar Control
- Reduced Heat Gain
- Durable Pyrolytic Surface
- Consistent Color Aesthetics
- Good Light Transmittance
- Low Exterior Reflectance
- Excellent Availability
- Reduced Lead Times

Applications

- Commercial Buildings Requiring Solar and Thermal Control
- Low, Mid and Hi-Rise
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential

Technical Bulletins

ATS 133
Cleaning Solar-E™

ATS 162
Single Glazing Solar-E™

ATS 164
How Solar-E™ Works


High Performance Tinted Glass
provides color, excellent solar
performance and comfort.
DALBY BUILDING

Pilkington Tinted Float Glass

Description

Pilkington's High Performance Tinted Glass provides significant improvements in solar performance compared to normal tinted glass. The colors are richer, however natural views from the interior are maintained with low exterior reflectance. They are readily available and can be processed and fabricated similarly to normal float glass to provide an economical choice for reducing air-conditioning loads and costs.

- Pilkington **EverGreen™** Glass*
  An uncoated tinted float glass with high daylight transmittance and solar control, it offers 20 percent better solar performance than other green tints, with reduced glare and UV.

- Pilkington **Arctic Blue™** Glass*
  A unique blue tinted float engineered for high daylight transmittance, good solar control and cool, comfortable color. It also provides a soft, undistorted natural view from the interior.

- Pilkington **SuperGrey™** Glass*
  Provides the best solar control of any uncoated float glass. The deep grey color provides daytime privacy from the outside and reduced see-through. The glass softens bright daylight and reduces glare with 9 percent light transmittance making it appropriate for use in skylights or near computer monitors.

- Pilkington **Optifloat™** Tinted Glass
  Reduces unwanted heat gain while admitting high natural daylight to enhance visual performance and lower artificial lighting needs. Available in Blue-Green, Grey and Bronze, Pilkington **Optifloat™** Tinted Glass is aesthetically pleasing and performance driven, with significantly reduced solar heat and UV light transmittance as compared to uncoated clear glass products.

* Denotes a High Performance Tinted Glass

Thermal Safety

The high performance tinted glass range absorbs a large proportion of solar radiation. All tinted and Low-E applications must be checked for thermal stress breakage.

Features and Benefits

- Tinted Float Glass – without coatings optimizes light transmittance and reduces cooling loads.

- Low External and Internal Reflectance – All tinted products provide good daylight transmittance with low reflectivity.

- Low UV Transmittance – outperforms other tinted products for reduced fading, Pilkington **SuperGrey™** eliminates 99 percent of UV transmittance.

Applications

- Buildings with a Desire for Color
- Low, Mid and Hi-Rise
- Medical/Hospital
- Educational/Schools
- Office
- Retail


The beginning of infinite
possibilities and applications.

Pilkington **Optifloat™** Clear Glass

Description

Pilkington **Optifloat™** sets the standard for quality and vision. It is the name we give our base products that are manufactured using the float glass process that was invented by Pilkington and has revolutionized the manufacturing of glass.

Pilkington **Optifloat™** Clear Glass offers excellent optical properties, transmitting up to 90 percent of the sun's visible spectrum to reduce artificial lighting needs. Clear Float is available from 3/32" (2.5mm) to 1/4" (6mm) to meet performance and aesthetics requirements where high light transmittance and visibility are desired. Pilkington **Optifloat™** provides ease of cutting and is ideal for further processing into a range of products available for general glazing, laminating, high performance coating, mirrors and decorative paint finishes.

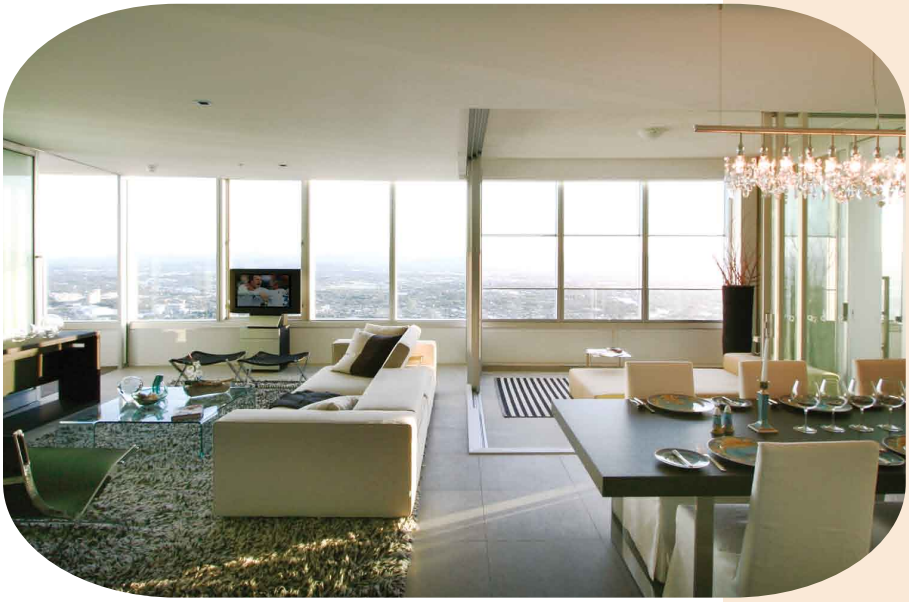
Pilkington **Optifloat™** Heavy Clear Glass, the only complete range of heavy float product manufactured in the U.S., is available from 5/16" (8mm) to 3/4" (19mm) thick for a wide variety of commercial glazing possibilities. It offers superior strength, greater spans, reduced deflection, high daylight transmittance and enhanced noise suppression. Ideal for large, frameless expanses of glass in lobby and entrance area applications.

Features and Benefits

- Clear glass to maximizes daylight transmittance.
- High clarity, low distortion with brilliant flat surfaces.
- Wide range of sizes and thicknesses for optimum utilization.

Applications

- Low, Mid and Hi-Rise
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential



Technical Bulletins

ATS 144
Cleaning Clear and Tinted Glass

ATS 149
Interference Fringes


Energy savings with
interior comfort.

Pilkington **Energy Advantage™** Low-E Glass

Description

Created using a patented color suppression process, Pilkington **Energy Advantage™** Low-E Glass is consistently color neutral and offers true high performance with emissivity 55 percent lower than first generation pyrolytics. By allowing much of the direct solar heat gain through the glazing, **Energy Advantage™** is often referred to as a "passive solar" glass product. **Energy Advantage™** is the Low-E glass of choice for residential and commercial applications that have a heating dominated HVAC load.

Also, using Pilkington **Energy Advantage™** Low-E Glass as the inboard lite in an I.G. unit creates a superior Pilkington **Sun Management™** Glass System that optimizes the solar control and energy efficiency of any glass – from clear float to high-performance tints, to Pilkington **Eclipse Advantage™** Solar Control Low-E Glass.

Note:

Other Pilkington Low-E products such as Pilkington **Eclipse Advantage™** and **Solar-E™** provide excellent thermal control. Full product descriptions for both can be found in the solar control section.

What is Low Emissivity?

Emissivity measures how strongly a product emits or radiates absorbed heat. The lower the number, the more efficiently the glass reduces conductive heat gain or heat loss, which means a lower U-Factor and better insulation. For comparison, uncoated glass has an emissivity of 0.84 and Pilkington **Energy Advantage™** is 0.15, which means only 15 percent of heat absorbed is re-emitted from the coated side. This feature is useful as it reflects energy back towards where it came from. If a solar control glass is used, then adding a lite of Low-E on the room side acts as a barrier to the absorbed heat in the glass passing to the inside of the building. For buildings that require passive heat gains, a low emissivity coating with clear glass allows direct solar radiation to pass through the glass and then traps it inside. So Pilkington **Energy Advantage™** reduces energy use.

Features and Benefits

- Color Neutral
- Durable Pyrolytic Surface
- Energy Efficient
- Easily Fabricated
- Improved Design Flexibility
- Excellent Availability
- Reduced Lead Times

Applications

- Commercial and Residential Buildings Requiring Solar and Thermal Control
- Low, Mid and Hi-Rise
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential

Technical Bulletins

ATS 133
Cleaning Low-E

ATS 135
Handling, Inspection and Fabrication of Low-E

ATS 137-3
Appearance of Low-E

ATS 138
How Low-E works

ATS 143
Hand Cleaning Low-E

ATS 148
Plant Growth Behind Low-E

ATS 161
First Surface Condensation

ATS 162
Single Glazing Low-E


Invisible fire protection.

Pilkington **Pyrostop™** and Pilkington **Pyrodur™**

Description

Specifically designed to provide high levels of fire protection, Pilkington **Pyrostop™** Fire Resistant Glass and Pilkington **Pyrodur™** Fire Protection Glass offer the full range of properties traditionally associated with glass – primarily natural lighting and transparency, along with options to reduce building heat loss, maximize solar control and provide acoustic insulation, human impact safety, security protection and decoration.

Pilkington **Pyrostop™** and Pilkington **Pyrodur™** are multiple laminates of float glass and a special transparent intumescent interlayer, which is totally compatible and optically homogeneous with the glass. When exposed to fire, the pane facing the flames fractures but remains in place. As the heat penetrates the glass, the interlayers, one after the other, react by foaming to form a thick, opaque, resilient and tough insulating shield that blocks the conductive and radiant heat of the blaze.

The Pilkington **Pyrostop™** and Pilkington **Pyrodur™** range includes performances from 20 to 120 minutes depending on the product chosen. These products must always be used as a part of an approved fire resistance or fire protected framing assembly. Pilkington **Pyrostop™** and Pilkington **Pyrodur™** are available through Technical Glass Products (TGP). Please contact Pilkington at (800) 221-0444 or Technical Glass Products at (800) 466-0279 for further details.

Features and Benefits

- Totally clear, unobstructed vision providing fire resistance and fire protection.
- Human impact safety rated category II.
- Allows natural light and transparency for fire rated walls, openings and doors. Egress areas can now be opened with glass for improved safety.
- Reduces fire damage to property and valuables.
- Provides escape corridors and protected access for fire fighters.
- Restricts the spread of heat, smoke, flames and hot gases.
- Limits conductive and radiative heat transfer with products available from 20 to 120 minutes.
- Excellent sound reduction properties.
- Designed to be combined with the full range of Pilkington glass products.
- Security, bullet and hurricane resistant configurations available with Pilkington **Pyrostop™**.
- Pilkington **Pyrostop™** passes the hose stream test required in the USA and Canada.
- All products classified with Underwriters Laboratories (UL) and accepted for use in NYC by Dept. of Buildings.
- Available in short lead times for internal or external applications.
- Now available with integral blinds.

Applications

- Interior and Exterior Glazing
- Low, Mid and Hi-Rise
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Fire-Rated Areas
- Renovated Spaces

Technical Bulletins

For Technical Inquiries, please contact Technical Glass Products at (800) 426-0279.

For Information on Pyroshield™ please contact Bret Penrod at (419) 478-0165.


A window that cleans itself.

Pilkington **Activ™** Self-cleaning Glass

Description

A revolutionary glass that uses the power of the sun to clean itself.

Not just a coating, but an integral part of the surface of the glass, Pilkington **Activ™** Self-cleaning Glass features a pyrolytic surface applied to clear float glass using an on-line chemical vapor deposition method. Pilkington **Activ™** is manufactured with the same advanced pyrolytic technology utilized in the production of conductive coatings on base glass panels for electronic and photovoltaic solar cell applications. Pilkington **Activ™** Glass uses UV energy from the sun, abundant even on cloudy, overcast days, to keep windows clean naturally with:

- A photocatalytic process that loosens dirt and gradually breaks down organic residue so it doesn't adhere to the glass.
- A hydrophilic action that causes rain to sheet on the glass, carrying dirt away with minimal spotting or streaking.

Under most conditions, natural rain is sufficient to keep the window clean, and a quick spray with a hose will achieve the same result even in prolonged dry weather.

Since these advanced properties are an integral part of the glass' surface, rather than just a coating, they aren't susceptible to peeling, separation or disintegration over time. In addition, they are not damaged by liquid glass cleaners.

Combined in an IGU unit with an inboard lite of either Pilkington **Energy Advantage™** Low-E Glass or laminated to Pilkington **Solar-E™** Solar Control Low-E Glass for excellent energy performance, Pilkington **Activ™** Self-cleaning Glass can dramatically reduce or eliminate window cleaning, while providing crisp, clear vistas and an unspoiled exterior aesthetic.

Features and Benefits

- Self Cleaning Properties
- Durable Pyrolytic Surface
- Never Needs Re-Treating
- Color Neutral
- Easily Fabricated
- Available in Various Glass Thickness

Applications

- Exterior Applications
- Low, Mid and Hi-Rise
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential

For additional information regarding Pilkington **Activ™** Self-cleaning Glass, please visit **www.activglass.com.**

The photocatalytic action of Pilkington **Activ™** Glass (upper) gradually breaks down and loosens organic dirt, while the hydrophilic surface (lower) causes rain to sheet on the glass, leaving a clean exterior with minimal spotting or streaking.

The hydrophilic action of Pilkington **Activ™** Glass (left) causes water to sheet rather than spot, as it does on ordinary glass (right).

Technical Bulletins

ATS 166
Maintenance and Cleaning Activ™

ATS 168
Handling, Inspection and Fabrication of Activ™

ATS 169
Glazing Activ™


Texture for every taste.

Pilkington **Texture™** Glass

Pilkington **Texture™** Glass comprises a range of textured styles and visual effects providing opportunities for modern design or the faithful re-creation of decor from a by-gone era. It is suitable for windows and interiors.

Description

Pilkington **Texture™** Glass is manufactured by passing a continuous molten glass ribbon between two rollers, one of which has a pattern that creates a permanent impression. Pilkington **Texture™** glass has all the attributes of glass – durability, ease of cleaning and resistance to scratching and marking. It is stocked by most distributors and is a low-cost decorative option.

Privacy with Translucency

Privacy is an important design consideration. Pilkington **Texture™** Glass is appropriate for areas requiring obscuration and privacy and for areas where privacy is required, without sacrificing any natural light. Pilkington **Texture™** Glass provides degrees of privacy through light diffusion and obscuration.

Wide Range of Texture Options

Available in more than 20 different textures to suit almost any design need. Refer to the following pages to view all the options.

Features and Benefits

- Contemporary Range – Stocked for Ease of Availability
- Economical Method of Providing Permanent Privacy and Decoration
- Diffused Daylight
- Unique Visual Effects
- Design
- Available in a Range of Thicknesses
- High Light Transmittance

Applications

- Windows for Privacy and Decoration
- Shower and Bath Enclosures
- Interior Partitions
- Door Inserts
- Wall Panels and Wall Features
- Furniture
- Backsplashes
- Exterior Glazing

Technical Bulletins

ATS 158
Texture™ Glass Strength

For more information on available sizes and thicknesses, please visit our website.
www.pilkington.com/na

Arctic™

Autumn™

Chantilly™

Digital™

Everglade™

Flemish™

Oak™

Pelerine™

Reeded™

Warwick™

Austral™

Morisco™

Charcoal Sticks™

Contora™

Cotswold™

Florielle™

Mayflower™

Minster™

Stippolyte™

Sycamore™

Taffeta™

Rayado™

Sparkel™

Yacare™


Stylish and private.

Pilkington **Optifloat™** Opal Glass

Description

While they can look stunning and create a beautiful effect, many of the semi-opaque glasses on the market have proved difficult to stock, handle and process – until now.

Pilkington **Optifloat™** Opal offers all the diffused natural light of a translucent glass, but with none of the drawbacks. An acid-etched product suitable for internal or external use, it creates an attractive finish for windows, partition walls, glass doors, furniture, shelving, wall cladding and many more applications.

But the real beauty is that it can be stored and processed in the same way as standard float glass, therefore, it's readily available from stock in a range of sizes and thicknesses and can be easily toughened, laminated or screen-printed – making Pilkington **Optifloat™** Opal the ideal choice.

Features and Benefits

- Acid Etched Glass
- High Light Transmittance
- Diffuses Light to give a uniform natural look.
- "Velvet Smooth" and Durable Surface
- Improved Design Flexibility
- Can be used internally and externally.
- Etched surface that is anti-reflective.

For Consumers

- High perceived value in any application.
- Creates excellent privacy while allowing light in.
- Weather Resistant

For Processors

- Available from Stock
- Can be stored and processed as ordinary float glass.
- Easily laminated and screen-printed.
- Available in 6 and 10mm thicknesses.
- Other thicknesses available by special order.
- Typical light transmittance of 82 percent.
- Available Stock Size 142 x 86.6"

Applications

- Windows
- Partition Walls
- Glass Doors
- Glass Furniture
- Doors
- Shelves and Cabinets
- Display Cases
- Working Surfaces
- Wall Cladding
- Balustrades


Glass that looks like
no glass at all...

Pilkington **OptiView™** Anti-Reflective Glass

Description

Pilkington **OptiView™** Anti-Reflective Glass combines two proprietary pyrolytic surfaces in a single laminated glass to minimize visible light reflectance to less than 2 percent compared to clear glass which is 8 percent; this will allow more visible light to pass through.

In addition to its anti-reflective/non-glaring properties, laminated Pilkington **OptiView™** Glass blocks more than 99 percent of transmitted UV to protect interiors and contents. At the same time it also offers the traditional benefits of laminated glass, including enhanced security, improved safety, damage protection, and superior acoustic control. The result is a unique fabricated glass that combines the strength, security and sound reduction of laminated glass with the low reflectivity of a high-end specialty glass product.

Coupled with large size capability and the fact that it can be tempered, insulated and bent like ordinary glass, Pilkington **OptiView™** Glass is not only ideal for typical anti-reflective uses such as museums and displays, but it's a practical and economic choice for retail storefronts, showrooms and a host of applications where an anti-reflective product was never an option.

All of which makes it a smart choice for places you've never seen anti-reflective glass before.

Pilkington **OptiView™** Anti-Reflective Glass...
It's the most amazing glass you'll never see.

Features and Benefits

- Reduces exterior and interior visible light reflectance to less than 2 percent.
- Transmits more than 90 percent visible light.
- Superior safety, security and acoustic performance.
- Blocks more than 99 percent of transmitted UV.
- Durable pyrolytic surface that is bendable and temperable.

Applications

- Retail Storefronts
- Displays
- Museums
- Showrooms
- Stadiums
- Where Views are a Priority

Technical Bulletins

ATS 182
Hand Cleaning OptiView™

ATS 183
Handling, Inspection and Fabrication of OptiView™ Glass

OptiView™ Anti-Reflective Glass | Clear Float Glass

OptiView™ Anti-Reflective Glass | Clear Float Glass

* The photo on the opposite page is an actual demonstration of clear glass versus OptiView™ in a display case application.

Photos have not been re-touched.


A discreet solution for
surveillance and observation.

Pilkington **Mirropane T.M.™** Transparent Mirror

Description

Pilkington **Mirropane T.M.™** is an observation mirror offering high quality, one-way vision that effectively provides discreet, unobtrusive monitoring. It has the appearance of a mirror on the subject side, while providing privacy to observers on the other side. It can also be laminated to provide protection from human impact and reduce noise or sound transmission.

Design Considerations

- Orientation
- Type of Lighting
- Background Colors
- Distances and Light Levels

  8:1 light ratio is recommended with subject side brightly lit, and observer side dimly lit.

Features and Benefits

- Durable Pyrolytic Surface
- Post Heat-Treatable
- High Reflectivity
- Excellent Availability
- Ideal for Surveillance
- Minimizes Read-Through

Applications

- Medical Facilities
- Surveillance Rooms

From the outside, **Mirropane T.M.™** offers an attractive yet discrete appearance.

From the inside, **Mirropane T.M.™** provides the comfort of privacy for surveillance and observation settings.

Technical Bulletins

ATS 125
Mirropane™ Guidelines

ATS 180
Hand Cleaning Mirropane™


Engineered
for the ultimate
performance.

Pilkington **TEC** Glass™

Description

Whether your application involves heated glass for commercial refrigeration, heat reflecting, electrochromics, appliance glass, computer screens, touch screens, static control, thin film photovoltaics, EMI/RFI shielding or other electro-optical and insulating applications, there is a durable pyrolytic Pilkington **TEC** Glass™ product to meet your specific performance requirements.

Pilkington **TEC** Glass™ offers a wide range of thermal and heated glass performance properties, while it also increases light transmittance and optimizes electrical conductivity.

Features and Benefits

- Electrically conductive for heated and thermal control, electrostatic dissipation and reduced transmittance of electromagnetic radiation.
- Color neutral, minimizing reflected color.
- Easily fabricated durable pyrolytic surface can be handled, cut, insulated, laminated, heat-strengthened and tempered.
- Bendable which allows the glass to be heat processed and bent after production.
- Excellent availability for reduced lead times and control of costs.
- Unlimited shelf life.
- Will not change color over time.
- Scratch and abrasion resistance.
- Available in a variety of glass thicknesses and sheet resistances ranging from 8 ohms/sq. up to several thousand ohms/sq.

There are a variety of Pilkington **TEC** Glass™ products to meet your specific needs, including:

TEC 15

The best choice for applications requiring passive condensation control and thermal performance with low emissivity and clear color-neutral appearance.

TEC 7

Offers the lowest resistivity value in the **TEC** Glass™ range. Combined with relatively low haze, it can be used for a wide range of applications including dye solar cells, electromagnetic shielding and thin film photovoltaics.

TEC 8

Designed for use specifically with amorphous silicon thin film photovoltaics. This product combines the low resistivity of **TEC 7** with a high haze coating required for good conversion efficiencies of amorphous silicon modules.

TEC 35, 50, 70, and 250

For use in heated glass applications, these products combine thermal control with superior electro-optical properties.

TEC SB

A barrier layer to avoid sodium migration into the deposited film, particularly at elevated temperatures. Therefore, the performance of an off-line coating is unaffected with the use of **TEC SB** as the coating substrate.

Technical Bulletins

ATS 187
Handling, Inspecting and Fabricating TEC Glass™


Energy Independence

Pilkington **TEC** Glass™ – Photovoltaics

Thin Film Photovoltaic Applications

TEC Glass™ products make a great choice for thin film photovoltaic (PV) applications.

Pilkington produces a range of transparent conductive oxides on glass substrates that have been specifically tuned to meet the requirements of the thin film PV industry.

Pilkington Transparent Electrically Conductive Glass, by acting as the superstrate in a PV module, is designed to maximize the light transmittance and optimize module efficiency for each of the thin film technologies.

All **TEC** Glass™ products are manufactured using a patented chemical vapor deposition process to produce a durable, color-neutral, pyrolytic coating. The Pilkington process provides a high degree of flexibility. Consequently, properties such as sheet resistance, haze and light transmittance can be optimized to meet individual customer's needs whether the technology is in amorphous silicon (a-Si), hybrid (a-Si/microcrystalline Si) or cadmium telluride thin film.

The PV range of **TEC** Glass™ products may be heat strengthened and fully tempered without any shift in sheet resistance.

Standard products include **TEC 15**, **TEC 7**, **TEC 8** and **NSG TCO**, a high conducting, high haze product for a-Si market. In addition, other variants are available to meet individual customer requirements.

These products are available in thicknesses varying from 2.3mm to 6mm.


Low iron glass for ultra-clear
transparency and clarity.

Pilkington **Optiwhite™** Glass

Description

When true color is of paramount importance, Pilkington **Optiwhite™** Float Glass is the perfect solution. Noticeably clearer than ordinary standard clear float glass, the colorlessness of **Optiwhite™** Float Glass is especially apparent when it is combined with white or light colors, or when exposed, polished edges are in view.

As a result, **Optiwhite™** Glass offers enhanced clarity and aesthetics for everything from photovoltaic modules and solar collectors to showroom and furniture applications. It is also ideal for use with glass which is to be ceramically decorated, allowing the true colors of the decorations to show through the glass.

Features and Benefits

- High clarity, low iron glass with a crystal clear appearance for special applications.
- Very high light transmittance of 92 percent.
- High solar transmittance for solar power.
- Can be toughened and laminated.
- Maintains clarity over the range of glass thickness.

Applications

- Storefronts and Displays
- Total Vision System Entries
- Furniture
- Appliance Glass
- Solar Collectors and Photovoltaics
- Special applications requiring thick glass such as bullet resistant glass, aquariums or Pilkington **Pyrostop™** Fire Resistant Glass.

The project photo shown on the opposite page is the world renowned Toledo Museum of Art Glass Pavilion, containing 150,000 square feet of Pilkington **Optiwhite™** glass.

Clear Float Glass Pilkington **Optiwhite™** Glass

Structural Glass Systems

Pilkington **Planar™**

Introduction

The development of the Pilkington **Planar™** fitting from Pilkington means that glass systems can be engineered for large glazed areas that are completely transparent. The system allows glass to be attached to a variety of support structures at any angle, providing completely flush fitting glass panels. Because the glass panels are individually fixed, there is no restriction on the height of the building which can be glazed.

The specially engineered bushings, bolts and fittings are standard for all designs, while support components may be designed and fabricated to suit specific applications. A wide variety of Pilkington glass types are available in heat treated laminated glasses, providing options in appearance and solar control, along with transparency and opacity.

The support structure can be conventional load bearing post and beam, horizontally or vertically constructed, and is often incorporated as part of the building's primary frame. Suspended glass and tensile truss systems can also be used. The support structure can be internal or external, and fittings have been developed for both options.

Description

Toughened glass panels are manufactured with four or six countersunk holes. Each Pilkington **Planar™** fitting comprises a countersunk bolt with a special nylon bushing and backing washer. This is attached to spring plates that are then connected to the support structure. The Pilkington **Planar™** fitting is designed to give minimal clamping to the spring plate to allow rotation of the glass. This reduces the stress developed in the glass compared to patch or conventional fittings.

Careful research into the stresses developed in Pilkington **Planar™** facade panels, especially around the fixing holes, has been an integral feature of the Pilkington **Planar™** system. Spring plates can be a stainless steel angle or casting. The glass panel joints are sealed with silicon sealant and are glazed into perimeter channels with gaskets or a non-setting sealant. All joints need to be designed to accommodate building movement.

Pilkington **Planar™** structural glass system is the original and still the leading structural glass system in the world. Invented by Pilkington over 35 years ago, Pilkington **Planar™** systems provide a complete glass envelope for building structures, satisfying the most demanding and creative architectural requirements. Façades can be on any plane either vertical, horizontal or multi-angled.

By combining Pilkington **Planar™** with the versatile range of products available from Pilkington, the world's largest glassmaker, superior system performance on both functional and aesthetic levels can be achieved.

The Pilkington **Planar™** system is handled and distributed by W&W Glass. For further product information visit **www.wwglass.com,** or contact W&W Glass at:

W&W Glass
300 Airport Executive Park
Suite 302
Nanuet, NY 10954-7403
Phone (800) 452-7925 or (845) 425-4000
Fax (845) 425-6156

Technical Information

For Technical Inquiries, please contact W&W Glass Company at (800) 452-7925 ext. 222

A unique, self-supporting U-channel system.

Pilkington **Profilit™** Profiled Glass

Description

Pilkington **Profilit™** is a self-supporting glazing system of U-shaped profiled glass and is supplied as a glass and framing system for facades and internal partitions. This highly durable product allows diffused light to enter the building while presenting a translucent external appearance. Pilkington **Profilit™** can be installed as a single wall unit or a double wall for additional sound and thermal insulation. The system can be configured vertically or horizontally.

Features

Pilkington **Profilit™** is an elongated "U-shaped" cast glass providing structural properties beyond normal flat glass.

Perimeter frame and self-supporting channels offer excellent flexibility to meet many radii and a wide range of design options.

Similar to Pilkington **Texture™**, Pilkington **Profilit™** Glass naturally transmits a high level of daylight, yet provides privacy due to its diffusion properties.

This system is an excellent alternative to glass block and other translucent materials for use in commercial and residential applications, both interior and exterior. The Pilkington **Profilit™** Glazing System has been widely used in Europe for more than 30 years.

Engineering, installation and technical support for Pilkington **Profilit™** Glass is coordinated by Technical Glass Products (TGP). For more information visit **www.fireglass.com**, or contact TGP.

Technical Glass Products

600 6th Street South
Kirkland, WA 98033
Phone (800) 426-0279
Fax (800) 451-9857

Product Details

The channels are manufactured in single lengths of up to 23 ft. Please consult with TGP for details on spans and safety requirements. The appearance of the glass presents a subtle texture providing light diffusion and privacy. The joints between the panels are silicon sealed.

Benefits

- Available in channel lengths up to 23 ft.
- Allows natural light in while maintaining privacy.
- Wired channels available for increased impact safety.
- Can be utilized in curved walls.
- Installs vertically or horizontally.
- Channels can be fully tempered.
- Aluminum perimeter frame provides structural strength.
- Excellent Light Transmission
- Minimal Maintenance
- Energy Efficient
- Proven Performance
- Sound Insulation

Technical Information

For Technical Inquiries, please contact Technical Glass Products at (800) 426-0279.

Warranty Information

Pilkington North America Inc.
Building Products Warranties

This warranty covers Pilkington **Activ™** Self-Cleaning Glass, **Arctic Blue™**, **Energy Advantage™** Low-E , **Eclipse Advantage™** Low-E, **EverGreen™**, **Mirropane T.M.™** Transparent Mirror, **Optifloat™** Opal, Clear and Tinted Glass, **Optar™**, **OptiView™** Anti-Reflective, **Optiwhite™** Clear, **Solar-E™** Low-E, **SuperGrey™**, **TEC** Glass™, **Texture™** and all other PILKINGTON NORTH AMERICA INC. ("PNA") tinted, clear and pyrolytically coated float glass products.

Glass Warranty

PNA warrants that, with proper handling and maintenance, each of its above named glass building products (or in the case of pyrolytically coated glass products, the glass to which the coating is applied) will meet PNA's own published standards, which can be found at www.pilkington.com/na (current as of the date of original factory shipment by PNA) and specifications detailed in ASTM C1036 and / or EN572 for flat glass. This warranty shall extend for a period of ten (10) years from the date of original factory shipment.

Coating Warranty

PNA further warrants that, with proper handling and maintenance, the PNA applied coating on each of its above named pyrolytically coated glass building products will not peel under normal conditions for a period of ten (10) years from the date of original factory shipment.

PNA further warrants that, with proper handling and maintenance, the PNA applied coating on its **Activ™** Self-Cleaning Glass will not be defective under normal conditions for a period of ten (10) years from the date of original factory shipment. For the purpose of this paragraph, a coating defect means only (i) failure of the special hydrophilic features of the **Activ™** Self-Cleaning Glass that is evidenced by the fact that the contact angle of the water on the pane is more than 25 degrees in the manually cleaned and activated condition providing the handling and processing instructions with respect to the sealant recommendations have been followed or (ii) the complete delamination of the special coating of the **Activ™** Self-Cleaning Glass that does not arise from any improper cleaning, handling, or processing and is evident within ten (10) years from the date of original factory shipment.

Warranty Claims; Confirmation of Defect;

Notwithstanding other provisions of the PNA warranties, any warranty claim will be void unless (a) such claim is made in writing and is received by PNA within thirty (30) days after the earlier of the date that an alleged defect is actually discovered or the date when such alleged defect should have been discovered, and (b) such alleged defect, including the earlier non-discoverability of same, has been confirmed by (in PNA's sole discretion) a field inspection by PNA's qualified representative and/or having samples returned to PNA for examination and laboratory analysis. Any waiver of the foregoing, including PNA's right to confirm defective products through inspection or laboratory testing, must be in writing and signed by PNA to be binding against PNA. Notwithstanding other provisions of the PNA warranties, any warranty claim will be void unless it is received by PNA before expiration of the warranty period.

Requirements for Proper Handling and Maintenance; Copies of Instructions

Each of the foregoing warranties is subject to the products having been fabricated, transported, installed, used, cleaned, and maintained, all in accordance with PNA's published instructions. It is essential that fabricators, glazing contractors, providers of cleaning services, and end users be familiar with such instructions. Copies of such instructions are available at www.pilkington.com/na.

ALL OTHER WARRANTIES ARE DISCLAIMED.

THE FOREGOING ARE THE ONLY WARRANTIES FOR THE ABOVE NAMED PRODUCTS. EXCEPT FOR THE FOREGOING LIMITED WARRANTIES, AND NOTWITHSTANDING ANY WARRANTIES THAT MAY BE MADE BY FABRICATORS, ASSEMBLERS, OR DISTRIBUTORS TO THIRD PARTIES UPON ANY RE-SALE OF THE ABOVE NAMED PRODUCTS, PNA HEREBY DISCLAIMS ALL REPRESENTATIONS OR WARRANTIES OF ANY KIND TO ANY PERSON, WHETHER EXPRESS OR IMPLIED, IN FACT OR IN LAW, INCLUDING WITHOUT LIMITATION THE WARRANTY OF MERCHANTABILITY OR THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, REGARDLESS OF PNA'S KNOWLEDGE (IF ANY) OF THE INTENDED USE OF THE PRODUCTS.

Limitation of Remedy; Limitation of Liability Exclusive Remedy:

PNA's sole liability under either of the foregoing warranties shall be limited to replacement of the PNA glass product that is confirmed to be defective with the same delivery terms as applied to the original shipment, or, at PNA's option, to refund of the purchase price. If PNA elects to replace the product, product furnished as such replacement will carry the same warranties for the balance of the original warranty period, and the same delivery terms that applied to the original shipment. Such replacement or refund is the sole and exclusive remedy provided under each of the foregoing warranties. **Limitation of Liability:** In no event shall PNA or its directors, officers, employees, or agents be liable (a) for glass breakage, for glass degradation, or coating damage caused by seal failure in an insulating unit or incompatible ceramic frits fired onto either surface of the glass, or in any case for any costs of removal, installation, or refabrication and reinstallation, for loss of use, or for incidental, consequential, or other damages of any kind; (b) for any costs of glass removal, installation or refabrication and reinstallation; (c) for direct damages in excess of the monetary amounts set forth in the exclusive remedy above; or (d) for any incidental, consequential, or other damages of any kind.

Single Glass Standards

Pilkington Monolithic Annealed Glass Sizes

Product	Quality Levels[1]	Nominal Glass Thickness		Approx. Weight[4]		Thickness Tolerance Range[1]				Maximum Standard Size[2,3]	
						in.		mm			
		in.	mm	lb/ft^2	kg/m^2	min.	max.	min.	max.	in.	mm
Optifloat Clear, **Activ, OptiView, Energy Advantage Low-E, Solar-E** Solar Control Low-E Glass	Q3	**3/32**	2.5	1.2	6	0.085	0.101	2.16	2.57	96x130	2438x3302
		1/8	3	1.6	8	0.115	0.134	2.92	3.40	102x130	2591x3302
		5/32	4	2.1	10	0.149	0.165	3.78	4.19	130x180	3302x4572
	Q1/Q3	**3/16**	5	2.5	12	0.180	0.199	4.57	5.05	130x204	3302x5182
	Q2/Q3	**1/4**	6	3.1	15	0.219	0.244	5.56	6.20		
Optifloat Heavy Clear, **Energy Advantage** Low-E or **Solar-E** Solar Control Low-E Glass	Q3	**5/16**	8	4.1	20	0.292	0.332	7.42	8.43	130x204	3302x5182
		3/8	10	5.2	25	0.355	0.406	9.02	10.31		
		1/2	12	6.6	32	0.469	0.531	11.91	13.49	130x240	3302x6096
Optifloat Heavy Clear		**5/8**	16	8.2	40	0.595	0.656	15.09	16.66	130x204	3302x5182
		3/4	19	9.9	48	0.719	0.781	18.26	19.84		
Optifloat Heavy Grey Tint or Bronze Tint	Q3	5/16	**8**	4.1	20.3	0.303	0.327	7.70	8.30	130x204	3302x5182
		3/8	**10**	5.2	25.4	0.382	0.406	9.70	10.30		
		1/2	12	6.6	32.0	0.469	0.531	11.91	13.49	130x240	3302x6096
Optifloat Grey Tint or Bronze Tint	Q3	**1/8**	3	1.6	8.0	0.115	0.134	2.92	3.4	102x130	2591x3302
		3/16	**5**	2.6	12.7	0.189	0.205	4.80	5.2	130x204	3302x5182
		1/4	**6**	3.1	15.2	0.228	0.244	5.80	6.20	130x204	3302x5182
Optifloat Heavy Blue-Green Tint	Q3	5/16	**8**	4.1	20.3	0.303	0.327	7.70	8.30	130x204	3302x5182
		3/8	**10**	5.2	25.4	0.382	0.406	9.70	10.30		
Optifloat Blue-Green Tint, Evergreen High-Performance Tint or SuperGrey High-Performance Tint	Q3	**1/8**	3	1.6	8.0	0.115	0.134	2.92	3.40	102x130	2591x3302
		3/16	**5**	2.6	12.7	0.189	0.205	4.80	5.20	130x204	3302x5182
		1/4	**6**	3.1	15.2	0.228	0.244	5.80	6.20	130x180	3302x5182
Arctic Blue High-Performance Tint	Q3	5/32	**4**	2.1	10.1	0.150	0.165	3.80	4.20	130x180	3302x4572
		1/4	**6**	3.1	15.2	0.228	0.244	5.80	6.20	130x204	3302x5182
		3/8	**10**	5.2	25.4	0.382	0.406	9.70	10.30	130x204	3302x5182
Eclipse Advantage Low-E Glass or **Mirropane T.M.**. Transparent Mirror	Q3	1/4	**6**	3.1	15.2	0.228	0.244	5.80	6.20	130x204	3302x5182
Optiwhite Low Iron Float Glass	EN572-2	1/8	**3**	1.6	7.6	0.110	0.126	2.80	3.20	88.6x126.4	2250x3210
		3/16	**5**	2.6	12.7	0.189	0.205	4.80	5.20		
		1/4	**6**	3.1	15.2	0.228	0.244	5.80	6.20		
		3/8	**10**	5.2	25.4	0.382	0.406	9.70	10.30	126.4x200.8	3210x5100
		1/2	**12**	6.2	30.4	0.461	0.484	11.70	12.30		
		5/8	**15**	7.8	38.0	0.571	0.61	14.5	15.5		
		3/4	**19**	9.8	48.2	0.709	0.787	18	20		
Texture Glass (all products except as noted below)	EN572-5	5/32	**4**	2.1	10.1	0.142	0.157	3.80	4.20	52.0x83.9	1320x2130
		1/4	**6**	3.1	15.2	0.228	0.244	5.70	6.30		
Reeded (Texture Glass)	EN572-5	5/32	**4**	2.1	10.1	0.150	0.165	3.80	4.20	52.0x83.9	1320x2130
Austral & Morisco (Texture Glass)	EN572-5	5/32	**4**	2.1	10.1	0.142	0.157	3.80	4.20	63.0x98.4	1600x2500
Rayado, Sparkel and Yacare (Texture Glass)	EN572-5	5/32	**4**	2.1	10.1	0.142	0.157	3.80	4.20	57.1x88.6	1450x2250

1. Per ASTM C 1036; with exception of **Texture™** and **Optiwhite™**
2. Size listed may, in some cases, be too large to meet applicable static load requirements.
3. Certain other thicknesses and sizes may be available upon request
4. Based on the mean of the thickness range. Note glass density = 158 lb./cu. ft.
5. Typical production nominal glass thickness in bold typeface
6. Coated glasses meet quality level of ASTM C 1376

* Pilkington **Optifloat™** Blue-Green Glass: 1/8" and 5mm are not standard products

* Subject to Availability

Single Glass Performance Data [1,10]

Product	Nominal Glass Thickness		Visible Light[2]			Solar Energy[2]			U-Factor[5]			Solar Heat Gain Coeffi-cient[7]	Shading Coeffi-cient[8]
			Trans-mittance[3] %	Reflectance[4] %		Trans-mittance[3] %	Reflect-ance[4] %	UV Trans-mittance[2] %	U.S. Summer	U.S. Winter	European[6]		
	in.	mm		Outside	Inside								
Pilkington Uncoated Float Glass													
Optifloat Clear	3/32	2.5	90	8	8	86	8	75	0.95	1.05	5.9	0.87	1.00
	1/8	3	90	8	8	84	8	72	0.94	1.04	5.8	0.86	0.99
	5/32	4	89	8	8	81	7	68	0.94	1.04	5.8	0.84	0.97
	3/16	5	89	8	8	80	7	65	0.93	1.03	5.8	0.83	0.96
	1/4	6	88	8	8	77	7	63	0.93	1.03	5.7	0.82	0.94
	5/16	8	87	8	8	73	7	57	0.92	1.01	5.7	0.79	0.91
	3/8	10	86	8	8	70	7	54	0.91	1.00	5.6	0.77	0.88
	1/2	12	84	8	8	64	6	49	0.89	0.98	5.5	0.73	0.84
	5/8	16	83	8	8	59	6	45	0.88	0.97	5.4	0.70	0.81
	3/4	19	81	7	7	55	6	41	0.86	0.95	5.3	0.67	0.78
Optifloat Grey Tint	1/8	3	61	6	6	59	6	35	0.94	1.04	5.8	0.69	0.80
	3/16	5	50	6	6	48	5	26	0.93	1.03	5.8	0.62	0.71
	1/4	6	44	5	5	41	5	21	0.93	1.02	5.7	0.57	0.66
	5/16	8	33	5	5	31	5	14	0.92	1.01	5.7	0.50	0.59
	3/8	10	28	5	5	26	5	11	0.91	1.00	5.6	0.47	0.55
	1/2	12	19	4	4	17	4	7	0.89	0.98	5.5	0.42	0.49
Optifloat Bronze Tint	1/8	3	68	6	6	65	6	37	0.94	1.04	5.8	0.73	0.84
	3/16	5	59	6	6	55	6	28	0.93	1.03	5.8	0.67	0.77
	1/4	6	51	6	6	48	5	22	0.93	1.02	5.7	0.62	0.72
	5/16	8	44	5	5	39	5	16	0.92	1.01	5.7	0.56	0.65
	3/8	10	39	5	5	34	5	13	0.91	1.00	5.6	0.53	0.61
	1/2	12	29	5	5	25	4	8	0.89	0.98	5.5	0.47	0.55
Optifloat Blue-Green Tint	1/4	6	75	7	7	48	6	32	0.93	1.02	5.7	0.62	0.72
	5/16	8	70	7	7	40	5	25	0.92	1.01	5.7	0.57	0.66
	3/8	10	67	6	6	36	5	21	0.91	1.00	5.6	0.54	0.63
EverGreen High-Performance Tint	1/8	3	76	7	7	49	6	27	0.94	1.04	5.8	0.62	0.72
	3/16	5	73	7	7	42	5	21	0.93	1.03	5.8	0.58	0.67
	1/4	6	66	6	6	33	5	14	0.93	1.02	5.7	0.52	0.60
Arctic Blue High-Performance Tint	5/32	4	65	6	6	45	5	31	0.94	1.04	5.8	0.60	0.69
	1/4	6	53	6	6	33	5	20	0.93	1.02	5.7	0.52	0.60
	3/8	10	39	5	5	20	5	12	0.91	1.00	5.6	0.43	0.51
SuperGrey High-Performance Tint	1/8	3	25	5	5	23	4	6	0.94	1.04	5.8	0.45	0.52
	3/16	5	12	4	4	11	4	2	0.93	1.03	5.8	0.37	0.44
	1/4	6	9	4	4	8	4	1	0.93	1.03	5.7	0.35	0.41
Pilkington **Optiwhite™** Low Iron Glass													
Optiwhite Low Iron	1/8	3	91	8	8	90	8	87	0.94	1.04	5.8	0.91	1.04
	3/16	5	91	8	8	89	8	85	0.93	1.03	5.8	0.90	1.04
	1/4	6	91	8	8	89	8	84	0.93	1.02	5.7	0.90	1.03
	3/8	10	90	8	8	87	8	81	0.91	1.00	5.6	0.89	1.02
	1/2	12	90	8	8	86	8	79	0.90	0.99	5.5	0.88	1.01
	5/8	15	90	8	8	85	7	77	0.88	0.97	5.4	0.87	1.00
	3/4	19	89	8	8	83	7	74	0.86	0.95	5.3	0.86	0.99

Product	Nominal Thickness		Glass Substrate	Visible[2] Transmittance %	Visible[2] Reflectance On The Coated Side %	Visible[2] Reflectance Glass Side %	Recommended Light Ratio	Proper Glazing
	in.	mm						
Pilkington **Mirropane T.M.**	1/4	6	Grey	11	68	16	8:1 Subject-side: Observer-side	Mirror coating toward subject-side

Single Glass Performance Data [1,10]

Product	Nominal Glass Thickness		Visible Light[2]			Solar Energy[2]			U-Factor[5]			Solar Heat Gain Coeffi-cient[7]	Shading Coeffi-cient[8]
			Trans-mittance[3]	Reflectance[4] %		Trans-mittance[3]	Reflect-ance[4]	UV Trans-mittance[2]					
	in.	mm	%	Outside	Inside	%	%	%	U.S. Summer	U.S. Winter	European[6]		
Pilkington Energy Advantage™ Low-E Glass (#2 Surface)[9]													
Energy Advantage Low-E	3/32	2.5	83	11	11	71	11	60	0.50	0.65	3.7	0.74	0.85
	1/8	3	82	11	12	69	11	57	0.50	0.65	3.7	0.72	0.83
	5/32	4	82	10	11	68	10	55	0.49	0.65	3.7	0.71	0.82
	3/16	5	83	11	12	68	10	53	0.49	0.65	3.7	0.71	0.82
	1/4	6	82	10	11	66	10	49	0.49	0.64	3.6	0.70	0.81
	5/16	8	81	10	11	62	9	45	0.49	0.64	3.6	0.67	0.77
	3/8	10	80	10	11	59	9	42	0.49	0.63	3.6	0.64	0.75
Pilkington Eclipse Advantage™ Low-E Glass (#2 Surface)[9]													
Eclipse Advantage Clear	1/4	6	67	25	28	58	19	30	0.53	0.67	3.8	0.62	0.72
Eclipse Advantage Grey	1/4	6	32	10	27	29	8	10	0.53	0.67	3.8	0.41	0.48
Eclipse Advantage Bronze	1/4	6	38	11	27	35	10	11	0.53	0.67	3.8	0.45	0.53
Eclipse Advantage Blue-Green	1/4	6	56	19	27	35	11	16	0.53	0.67	3.8	0.45	0.53
Eclipse Advantage EverGreen	1/4	6	48	15	27	23	8	7	0.53	0.67	3.8	0.36	0.43
Eclipse Advantage Arctic Blue	1/4	6	39	12	27	23	8	10	0.53	0.67	3.8	0.36	0.42
Pilkington Solar-E™ Solar Control Low-E Glass (#2 Surface)[9]													
Solar-E Solar Control Low-E	1/8	3	60	8	9	46	8	48	0.50	0.65	3.7	0.54	0.63
	5/32	4	60	8	9	44	8	46	0.50	0.65	3.7	0.53	0.62
	3/16	5	60	7	9	48	7	44	0.50	0.65	3.7	0.53	0.61
	1/4	6	60	8	9	46	7	44	0.50	0.65	3.7	0.52	0.61
	5/16	8	59	8	9	42	7	41	0.50	0.64	3.7	0.51	0.59
Pilkington OptiView™ Anti-Reflective Glass													
OptiView Anti-Reflective Glass	1/4	6	92	1.7	1.7	70	4	<1	0.67	0.80	4.6	0.76	0.88
Clear Float Glass	1/4	6	88	8	8	77	7	63	0.93	1.02	5.7	0.81	0.94
OptiView Anti-Reflective Glass	1/2	12	88	1.7	1.7	61	3	<1	0.67	0.79	4.5	0.70	0.81
Clear Float Glass	1/2	12	84	8	8	64	6	49	0.89	0.98	5.5	0.73	0.84
Pilkington Activ™ Self-cleaning Glass (#1 Surface)													
Activ Self-Cleaning	3/32	2.5	84	15	15	82	12	50	0.95	1.05	5.9	0.83	0.96
	1/8	3	83	15	15	80	13	49	0.94	1.04	5.8	0.82	0.94
	5/32	4	83	15	15	79	12	47	0.94	1.04	5.8	0.81	0.93
	3/16	5	83	15	14	77	12	46	0.93	1.03	5.8	0.80	0.92
	1/4	6	82	15	15	75	12	44	0.93	1.02	5.8	0.78	0.90

Clear float glass performance based on non-laminated glass.

Pilkington **OptiView™** Anti-Reflective Glass performance based on:

- 6mm (1/4") laminated glass: 3mm (1/8") **OptiView™** (#1) + 0.76mm (0.030") clear pvb + 3mm (1/8") **OptiView™** (#4)
- 12mm (1/2") laminated glass: 6mm (1/4") **OptiView™** (#1) + 0.76mm (0.030") clear pvb + 6mm (1/4") **OptiView™** (#4)

Notes: Contact Pilkington for other **OptiView™** thickness and laminated glass combinations.

Double Glass Performance Data [1,10]

Insulating units constructed of equal glass thicknesses and 1/2" (12.7mm) airspace

Product	Nominal Glass Thickness		Visible Light[2]			Total Solar Energy[2]			U-Factor[5]						Solar Heat Gain Coeffi-cient[7]	Shading Coeffi-cient[8]
			Trans-mittance[3] %	Reflectance[4] %		Trans-mittance[3] %	Reflect-ance[4] %	UV Trans-mittance[2] %	U.S. Summer		U.S. Winter		European[6]			
	in.	mm		Outside	Inside				Air	Argon	Air	Argon	Air	Argon		
Pilkington Uncoated Float Glass Outer Lite and Clear Float Glass Inner Lite																
Optifloat Clear	3/32	2.5	82	15	15	74	14	61	0.51	–	0.48	–	2.8	–	0.78	0.90
	1/8	3	81	15	15	71	13	57	0.51	–	0.48	–	2.8	–	0.76	0.88
	5/32	4	80	15	15	67	12	52	0.50	–	0.48	–	2.8	–	0.74	0.85
	3/16	5	79	15	15	64	12	50	0.50	–	0.48	–	2.8	–	0.72	0.83
	1/4	6	78	15	15	61	12	47	0.50	–	0.47	–	2.8	–	0.70	0.81
Optifloat Grey Tint	1/8	3	55	9	13	50	9	29	0.51	–	0.48	–	2.8	–	0.58	0.67
	3/16	5	45	8	13	39	7	21	0.50	–	0.48	–	2.8	–	0.50	0.58
	1/4	6	39	7	12	32	6	17	0.50	–	0.47	–	2.8	–	0.45	0.52
Optifloat Bronze Tint	1/8	3	62	10	13	55	9	31	0.51	–	0.48	–	2.8	–	0.63	0.72
	3/16	5	53	9	13	45	8	23	0.50	–	0.48	–	2.8	–	0.55	0.64
	1/4	6	45	8	12	38	7	18	0.50	–	0.47	–	2.8	–	0.50	0.58
Optifloat Blue-Green Tint	1/4	6	67	12	14	39	8	26	0.50	–	0.47	–	2.8	–	0.50	0.58
EverGreen High-Performance Tint	1/8	3	69	12	14	42	8	23	0.51	–	0.48	–	2.8	–	0.51	0.59
	3/16	5	65	11	14	35	7	18	0.50	–	0.48	–	2.8	–	0.46	0.53
	1/4	6	58	10	13	28	6	11	0.50	–	0.47	–	2.8	–	0.40	0.46
Arctic Blue High-Performance Tint	1/4	6	47	8	13	27	6	17	0.50	–	0.47	–	2.8	–	0.39	0.46
SuperGrey High-Performance Tint	1/8	3	23	5	12	19	5	6	0.51	–	0.48	–	2.8	–	0.32	0.37
	3/16	5	11	4	12	9	4	2	0.50	–	0.48	–	2.8	–	0.24	0.28
	1/4	6	8	4	11	6	4	1	0.50	–	0.47	–	2.8	–	0.21	0.25
Pilkington **Eclipse Advantage™** Low-E Glass Outer Lite (#2 Surface) and Clear Float Glass Inner Lite																
Eclipse Advantage Clear	1/4	6	60	29	31	46	21	24	0.35	0.30	0.35	0.30	1.9	1.7	0.55	0.63
Eclipse Advantage Grey	1/4	6	29	10	29	23	9	8	0.35	0.30	0.35	0.30	1.9	1.7	0.33	0.39
Eclipse Advantage Bronze	1/4	6	34	13	29	28	11	9	0.35	0.30	0.35	0.30	1.9	1.7	0.38	0.44
Eclipse Advantage Blue-Green	1/4	6	51	21	29	29	12	13	0.35	0.30	0.35	0.30	1.9	1.7	0.38	0.44
Eclipse Advantage EverGreen	1/4	6	43	17	30	20	9	6	0.35	0.30	0.35	0.30	1.9	1.7	0.29	0.33
Eclipse Advantage Arctic Blue	1/4	6	35	13	30	19	9	9	0.35	0.30	0.35	0.30	1.9	1.7	0.29	0.33
Pilkington **Activ™** Self-Cleaning Glass Outer Lite (#1 Surface) and Clear Glass Inner Lite																
Activ Self-Cleaning	3/32	2.5	77	21	21	71	18	42	0.51	-	0.48	-	2.8	-	0.75	0.86
	1/8	3	76	21	21	68	17	40	0.51	-	0.48	-	2.8	-	0.73	0.84
	5/32	4	75	21	20	65	17	38	0.50	-	0.48	-	2.8	-	0.72	0.82
	3/16	5	75	20	20	62	16	36	0.50	-	0.48	-	2.8	-	0.70	0.81
	1/4	6	74	21	20	59	16	34	0.50	-	0.47	-	2.8	-	0.68	0.78
Pilkington **Energy Advantage™** Low-E Glass Outer Lite (#2 Surface) and Clear Float Glass Inner Lite																
Energy Advantage Low-E	3/32	2.5	76	17	18	62	16	48	0.33	0.28	0.34	0.29	1.9	1.6	0.67	0.77
	1/8	3	75	17	18	59	15	45	0.33	0.28	0.33	0.29	1.9	1.6	0.65	0.75
	5/32	4	74	16	17	56	14	42	0.33	0.28	0.33	0.29	1.9	1.6	0.63	0.73
	3/16	5	74	17	17	55	14	41	0.33	0.28	0.33	0.29	1.9	1.6	0.63	0.73
	1/4	6	73	16	17	52	13	37	0.33	0.28	0.33	0.29	1.8	1.5	0.62	0.71
	5/16	8	71	15	16	47	12	32	0.33	0.28	0.33	0.28	1.8	1.5	0.58	0.67
	3/8	10	69	15	16	43	12	29	0.32	0.27	0.33	0.28	1.8	1.5	0.56	0.64
Pilkington **Solar-E™** Low-E Glass Outer Lite (#2 Surface) and Clear Float Glass Inner Lite																
Solar-E Solar Control Low-E	1/8	3	54	11	16	39	10	38	0.33	0.28	0.34	0.29	1.9	1.6	0.46	0.54
	5/32	4	54	10	16	38	9	36	0.33	0.28	0.34	0.29	1.9	1.6	0.47	0.53
	3/16	5	53	10	15	36	9	34	0.33	0.28	0.33	0.29	1.9	1.6	0.45	0.52
	1/4	6	53	11	15	35	9	33	0.33	0.28	0.33	0.29	1.9	1.6	0.45	0.51
	5/16	8	52	10	15	32	8	29	0.33	0.28	0.33	0.29	1.8	1.5	0.43	0.49

Double Glass Performance Data [1,10]

Insulating units constructed of equal glass thicknesses and 1/2" (12.7mm) airspace

Product	Nominal Glass Thickness		Visible Light[2]			Solar Energy[2]			U-Factor[5]						Solar Heat Gain Coeffi-cient[7]	Shading Coeffi-cient[8]
			Trans-mittance[3]	Reflectance[4] %		Trans-mittance[3]	Reflect-ance[4]	UV Trans-mittance[2]	U.S. Summer		U.S. Winter		European[6]			
	in.	mm	%	Outside	Inside	%	%	%	Air	Argon	Air	Argon	Air	Argon		
Pilkington Uncoated Float Glass Outer Lite and **Energy Advantage™** Low-E Glass Inner Lite (#3 Surface)																
Optifloat Clear	3/32	2.5	76	18	17	62	17	48	0.33	0.28	0.34	0.29	1.9	1.6	0.73	0.84
	1/8	3	75	18	17	59	16	45	0.33	0.28	0.33	0.29	1.9	1.6	0.71	0.82
	5/32	4	74	17	16	56	16	42	0.33	0.28	0.33	0.29	1.9	1.6	0.69	0.80
	3/16	5	74	17	17	55	15	41	0.33	0.28	0.33	0.29	1.9	1.6	0.68	0.79
	1/4	6	73	17	16	52	14	37	0.33	0.28	0.33	0.29	1.8	1.5	0.67	0.77
	5/16	8	71	16	15	47	13	32	0.33	0.28	0.33	0.28	1.8	1.5	0.63	0.72
	3/8	10	69	16	15	43	12	29	0.32	0.28	0.33	0.28	1.8	1.5	0.60	0.70
Optifloat Grey Tint	1/8	3	50	10	15	41	11	24	0.33	0.28	0.33	0.29	1.9	1.6	0.53	0.61
	3/16	5	42	8	15	32	8	17	0.33	0.28	0.33	0.29	1.9	1.6	0.45	0.51
	1/4	6	36	7	14	27	7	13	0.33	0.28	0.33	0.29	1.8	1.6	0.40	0.46
Optifloat Bronze Tint	1/8	3	57	12	15	45	12	25	0.33	0.28	0.33	0.29	1.9	1.6	0.57	0.66
	3/16	5	49	10	15	38	10	19	0.33	0.28	0.33	0.29	1.9	1.6	0.50	0.58
	1/4	6	42	8	14	32	8	14	0.33	0.28	0.33	0.29	1.8	1.5	0.45	0.52
Optifloat Blue-Green Tint	1/4	6	62	13	15	34	9	21	0.33	0.28	0.33	0.29	1.8	1.6	0.45	0.52
EverGreen High-Performance Tint	1/8	3	64	14	16	35	9	18	0.33	0.28	0.33	0.29	1.9	1.6	0.46	0.53
	3/16	5	61	13	16	31	8	14	0.33	0.28	0.33	0.29	1.9	1.6	0.41	0.47
	1/4	6	54	11	14	24	7	9	0.33	0.28	0.33	0.29	1.8	1.5	0.35	0.40
Arctic Blue High-Performance Tint	1/4	6	43	9	14	23	7	13	0.33	0.28	0.33	0.29	1.8	1.5	0.34	0.39
SuperGrey High-Performance Tint	1/8	3	21	5	14	15	5	4	0.33	0.28	0.33	0.29	1.9	1.6	0.26	0.30
	3/16	5	10	4	14	7	4	2	0.33	0.28	0.33	0.29	1.9	1.6	0.18	0.21
	1/4	6	7	4	13	5	4	1	0.33	0.28	0.33	0.29	1.8	1.5	0.15	0.18
Pilkington **Eclipse Advantage™** Low-E Glass Outer Lite (#2 Surface) and **Energy Advantage™** Low-E Glass Inner Lite (#3 Surface)																
Eclipse Advantage Clear	1/4	6	56	30	30	41	22	19	0.30	0.25	0.31	0.26	1.7	1.4	0.53	0.61
Eclipse Advantage Grey	1/4	6	27	11	29	20	9	7	0.30	0.25	0.31	0.26	1.7	1.4	0.31	0.36
Eclipse Advantage Bronze	1/4	6	32	13	29	24	11	7	0.30	0.25	0.31	0.26	1.7	1.4	0.36	0.41
Eclipse Advantage Blue-Green	1/4	6	48	22	29	26	13	10	0.30	0.25	0.31	0.26	1.7	1.4	0.36	0.41
Eclipse Advantage EverGreen	1/4	6	40	18	29	18	9	5	0.30	0.25	0.31	0.26	1.7	1.4	0.27	0.31
Eclipse Advantage Arctic Blue	1/4	6	33	14	29	17	9	7	0.30	0.25	0.31	0.26	1.7	1.4	0.27	0.31
Pilkington **Activ™** Self-Cleaning Glass Outer Lite (#1 Surface) and **Energy Advantage™** Low-E Glass Inner Lite (#3 Surface)																
Activ Self-Cleaning	3/32	2.5	71	23	21	59	21	34	0.33	0.28	0.34	0.29	1.9	1.6	0.70	0.81
	1/8	3	70	24	22	56	21	33	0.33	0.28	0.33	0.29	1.9	1.6	0.68	0.78
	5/32	4	70	23	20	54	20	31	0.33	0.28	0.33	0.29	1.9	1.6	0.67	0.77
	3/16	5	70	23	21	53	19	30	0.33	0.28	0.33	0.29	1.9	1.6	0.66	0.76
	1/4	6	69	23	20	51	19	27	0.33	0.28	0.33	0.29	1.9	1.6	0.64	0.74
Pilkington **Activ™** Self-Cleaning Glass Outer Lite (#1 Surface) and **Solar-E™** Solar Control Low-E Glass Inner Lite (#3 Surface)																
Activ Self-Cleaning	1/8	3	51	22	13	37	20	27	0.33	0.28	0.34	0.29	1.9	1.6	0.64	0.74
	5/32	4	51	21	13	36	20	26	0.33	0.28	0.34	0.29	1.9	1.6	0.63	0.73
	3/16	5	50	21	13	35	19	25	0.33	0.28	0.33	0.29	1.9	1.6	0.62	0.71
	1/4	6	50	21	13	34	19	24	0.33	0.28	0.33	0.29	1.9	1.6	0.60	0.69
Pilkington **OptiView™** Anti-Reflective Glass Outer Lite and Inner Lite *																
OptiView Anti-Reflective	1/4	6	84	2.9	2.9	54	5	<1	0.32	0.29	0.33	0.29	1.9	1.7	0.66	0.76

Pilkington **OptiView™** Anti-Reflective Glass - Insulating Glass fabricated with two layers of Laminated Glass*
* 2 lites of Laminates Glass - each 1/8" **OptiView™** + pvb layer + 1/8" **OptiView™** (coating on all 4 glass to air surfaces)
Insulating units constructed of equal glass thicknesses and 1/2" (12.7mm) airspace

** Note: Pilkington **Eclipse Advantage™** Low-E products are not intended for use in #1 surface installations. It is generally preferable to glaze **Eclipse Advantage™** Low-E products with the coating on the #2 surface.

Pilkington TEC Glass Performance Data

Pilkington **TEC Glass™** Product Properties

Product	Thickness (mm)	Visible Transmittance (%)	Sheet Resistance (Ohms/sq.)	Haze (%)	Hemispherical Emmitance
TEC 7	2.2, 3.0, 4.0	80 - 82	6 - 8	5	0.12
TEC 8	2.2, 3.2	80 - 81.5	6 - 9	12	0.12
TEC 15	2.2, 3.0, 3.2, 4.0, 5.0, 6.0	82 - 84.5	12 - 14	≤ 0.74	0.15
TEC 35	3.2, 6.0	82 - 84	32 - 48	≤ 0.65	0.34
TEC 70	3.2, 4.0	82 - 84	58 - 72	0.5	0.45
TEC 250	3.2, 4.0	84 - 85	260 - 325	0.7	0.67
TEC 1000	3.2	88	≤	0.5	0.78
Clear	3.2	90	-	-	0.84

Notes: Nominal values shown. Specifications subject to change.
Substrate = Clear soda lime glass.

Pilkington **TEC Glass™** Refrigerator Door Passive Applications***

Glazing (Room/Cool side)	Airspaces (Number)	U-Value (W/m^2-°C)	Room-Side Glass Temp. (°C)	Condensation RH** (%)	RH Improvement (%)	Heat Flow Through Glass (W/m^2)	Heat Flow Reduction (%)	Power Density (W/m^2)
Clear/Clear	1	2.8	19	62	Base Case	64	Base Case	0
Clear/Clear/Clear	2	2.2	20	67	8	52	19	0
TEC 15/Clear	1	1.9	22	72	16	43	33	0

*Room-side temperature = 27°C, refrigeration temperature = 4°C.

Pilkington **TEC Glass™** Freezer Door Power Applications*

Glazing (Room/Cool side)	Airspaces (Number)	U-Value (W/m^2-°C)	Room-Side Glass Temp. (°C)	Condensation RH** (%)	RH Improvement (%)	Heat Flow Through Glass (W/m^2)	Heat Flow Reduction (%)	Power Density (W/m^2)
Triple Clear***	2	2.1	15	47	Base Case	101	Base Case	0
TEC 70/Clear/Clear	2	2.0	23	77	64	94	7	82
TEC 70/TEC 15	1	1.8	24	81	72	86	14	82
TEC 70/TEC 15/ Clear	2	1.7	25	86	83	82	19	82

*Room-side temperature = 27°C, freezer temperature = -20°C.
**Condensation along the room-side glass surface away from the frame when the relative humidity (RH) within the room is greater than the value noted.
***No power.

Notes:
All glass 3.2mm.
Airspace 12mm for doubles, 6mm for triples.
Airspaces filled with air.
All simulations utilizing LBNL Window 5.2
Demist heater power of 100 Watts (82 W/m2). Input voltage = 120 volts.
Unit 800 mm x 1,700 mm, bus bars along 800 mm dimensions.

Technical Bulletins

ATS 129
Properties

ATS 171
Optics and Window 5 Procedures

Performance Data Notes

1. Some combinations or installations may require heat treating to prevent glass breakage from thermal stress.

2. Visible, Solar and UV data are based on laboratory spectrophotometric measurements weighted by an appropriate weighting function(s) using LBNL Window 5.2 software. Wave length ranges of the sun's energy used to calculate properties: Visible from 0.38 to 0.78 microns, Solar from 0.30 to 2.5 microns and UV from 0.30 to 0.38 microns.

3. Transmittance – Percentage of normally incident visible light or solar energy passing directly through the glazing.

4. Reflectance – Percentage of normally incident visible light or solar energy reflected away from the glazing.

5. U-Factor (Btu/hr.sq ft.°F) – Measure of the heat gain or loss through glazing due to environmental differences between the outdoor and indoor air. U-Factors given are center-of-glass values calculated using LBNL Windows 5.2. Winter U-Factors are based on an outdoor temperature of 0°F (-18°C), an indoor temperature of 70°F (21°C) and a 12.3mph (5.5m/s) wind velocity with no sun. Summer U-Factors are based on an outdoor temperature of 90°F (32°C), an indoor temperature of 75°F (24°C), a solar intensity of 248 Btu/hr.sq ft.°F (783 W/sq m) and a 6.3mph (2.8m/s) wind. To obtain metric U-Factor (W/sq m.°C), multiply by 5.678. "U-Factor" is identical to the previously known term of "U-Value".

6. European U-Factor (W/sq m.K) is based on EN 410/673 (CEN) standard.

7. Solar Heat Gain Coefficient or SHGC – The ratio of the total solar heat gain through the glass relative to the incident solar radiation. The solar heat gain includes both the solar energy directly transmitted through the glass, plus the solar energy absorbed by the glass and subsequently convected and thermally radiated inward.

8. Shading Coefficient or SC – The ratio of solar heat gain through the glass relative to that through 1/8" (3mm) clear glass at normal incidence. Note that Relative Heat Gain or RHG (Btu/hr.sq ft.), which is the amount of heat gained through the glass at assumed summer conditions, can be calculated using the following equation: RHG = SC x 200 + Us x 14. To obtain metric RHG (W/sq m), multiply by 3.154.

9. Use of Pilkington **Energy Advantage™** Low-E, **Eclipse Advantage™** or **Solar-E™** Glass with the coating on the exposed interior surface may increase the possibility of condensation formation during winter conditions.

10. Typical values of Pilkington production are provided.

Design and Uniform Static Loads
ASTM Standard Practice E 1300 contains design load evaluation procedures for different glass thickness and failure probabilities. For a copy of this standard visit www.ASTM.org or write to:

ASTM
100 Bar Harbor Drive
West Conshohocken, PA 19428

For design and comprehensive technical data, please visit the Pilkington Web site:
www.pilkington.com/na

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All this and more are waiting for you at **www.pilkington.com**, your #1 source for glass and glazing information.

For more personalized assistance, to talk to one of our sales representatives, or request samples or technical information, please call Pilkington domestic sales at **(800) 221-0444**.

For Your Information
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Pilkington **Activ™** Self-Cleaning Glass, **Arctic Blue™**, **Energy Advantage™** Low-E , **Eclipse Advantage™** Low-E, **EverGreen™**, **Mirropane T.M.™** Transparent Mirror, **Optifloat™** Opal, Clear and Tinted Glass, **Optar™**, **OptiView™** Anti-Reflective, **Optiwhite™** Clear, **Planar™** Glass, **Profilit™** Glass, **Pyrostop™** Glass, **Pyrodur™** Glass, **Solar-E™** Low-E, **SuperGrey™**, **Sun Management™** Glass System, **TEC** Glass™, and **Texture™** are trademarks of Pilkington.
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