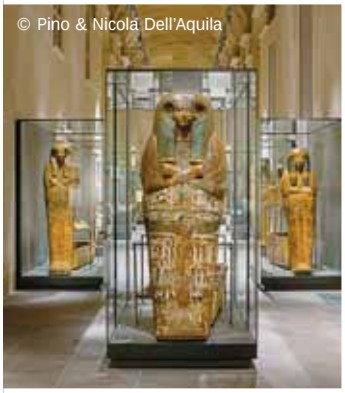

Architectural Glass Product Guide

Pilkington North America

X Cluster, Dubai
Pilkington **Eclipse Advantage**™ Arctic Blue

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We're making a difference to our world through glass technology.

Introduction

Company Overview

As a leading global glass manufacturer, the NSG Group 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 is the only transparent building material that 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. The NSG Group is committed to being at the forefront of these developments.

The Pilkington brand is synonymous with Flat Glass manufacturing excellence and innovation, with a reputation for leading many important technological advances in the glass industry, including the Float process, now the world standard for high quality glass production.

The selection of glass products has become more complex since Pilkington invented the float glass process in 1952. The properties of glass have 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.

Float Glass Manufacturing

Sir Alastair Pilkington's invention of the float glass process established the world standard for the production of high quality glass. Float Glass is manufactured by melting sand, soda ash, dolomite and limestone, along with other minor batch material, produce 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. Our glass products are available in clear, tinted, high performance tinted, coated, low iron and rolled glass.

Coated Glass

On-line pyrolytic coatings are produced by depositing microscopically thin layers of metallic oxides by the chemical vapor deposition (CVD) 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, low reflection and self-cleaning properties. NSG Group 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
Laminated 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 glass is at least four times stronger than annealed glass. When broken, it shatters into many small fragments which reduce major injuries. This type of glass is intended for glass facades, sliding doors, building entrances, bath and shower enclosures, and other uses requiring superior strength and safety properties.

Heat Strengthened
Annealed glass is subjected to a special heat-treatment in which it is heated to about 680°C (1256°F) and afterwards cooled. When it is cooled slower than 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 typical building codes.

Glass Selection

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

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. NSG Group 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 brand products are categorized by benefit-led category. Each category is identified by a symbol/icon representing the application.

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, www.pilkington.com/na

Not All Energy is the Same
To understand how revolutionary Pilkington brand 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 is a key issue in terms of energy savings. In hot conditions or for buildings with high internal loads, solar control glass is used to minimize solar heat gain by rejecting solar radiation and help control glare. In more temperate conditions, it can be used to balance solar control with high levels of natural light.
- 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, there is a combination of the two.
- In cold climates, Low-e glass will redirect energy (room heat) back into a building, to achieve much lower heat loss than ordinary float glass. Different types of Low-e glass allow different amounts of free energy from the sun, passive solar heat gain, helping to reduce heating requirements and costs, especially in colder months.

Noah's Ark Hotel and Casino
Iskele Bafra Tourism District, Vokolida
Pilkington **Eclipse Advantage**™ Blue-Green

Coating Technology and Sustainability

The Pilkington Pyrolytic Advantage
Whether you select one of our solar control low-e glasses (Pilkington **Eclipse Advantage™**, Pilkington **Solar-E™**, Pilkington **Solar-E™** Plus), or our thermal control low-e glass (Pilkington **Energy Advantage™**), you'll have the benefits of our patented pyrolytic technology and the very practical advantages that it brings to every project.

Pilkington North America's brand of low-e glass products are produced by a patented pyrolytic process that exposes hot glass to chemical vapors during the actual float glass production, where they bond to the glass at the molecular level.

Having a hard "pyrolytic" surface fired on at over 640°C (1200°F) make these pyrolytic products 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.

NSG Group Sustainability Initiative
The NSG Group has been proud to be a 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, the NSG Group is proud to lead in areas of environmental concern, sustainability and green building initiatives.

One of the most recognized architectural standards 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 "green building" 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 brand 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 the NSG Group for information regarding products that can help you achieve your LEED® certification.

For many years, Pilkington energy efficient products have shown a commitment to the environment by carrying the ENERGY STAR label. With our most recent Green Building Partnership, Pilkington North America will ensure its float glass manufacturing facilities that produce energy efficient products are also operated with concern for the environment.

One acre solar field
Pilkington Research & Development Center, Northwood, Ohio
NSG **TEC™**

Noah's Ark Hotel and Casino
Iskele Bafra Tourism District,
Vokolida
Pilkington **Eclipse Advantage**™
Blue-Green

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 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, regardless of its color.

SHGC (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.

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

What is Low Emissivity?
Emissivity measures how strongly a product emits or radiates absorbed heat. The lower the number, the more efficiently the object reduces conductive heat gain or heat loss, which means a lower U-factor and better insulation.

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 monolithic 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.

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.

Passive Solar Heat Gain

Passive solar heat gain is radiant energy generated from the sun. 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 the building.

Thermal control low-e glazing products like Pilkington **Energy Advantage**™ reduce energy usage by allowing passive solar heat to easily pass through the glazing. The pyrolytic low-e coating provides thermal insulation by reducing heat loss. That is why Pilkington **Energy Advantage**™ is known as a leading passive solar glazing product in the market.

Gulf Tower - Kuwait
Pilkington **Energy Advantage**™

Bowling Green State University
Recreation Center
Pilkington **Eclipse Advantage™**

Pilkington Online Resources at www.pilkington.com/na

Pilkington Sun Management Calculator
This interactive tool allows you to take glazing selection to a new level.

- Compare different glazing options and performance data.
- Review the interactive insulating unit graphic.
- Explore the related project references.
- Develop a custom specification.

Pilkington 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 Thermal Stress Calculator will do all the hard work for you.

Pilkington Wind Load Calculator
The Wind Load Calculator allows you to quickly check short duration loads for monolitic annealed glass, against ASTM E1300 Standard Practice for Determining Load Resistance.

Pilkington Continuing Education Center
Pilkington North America proudly sponsors continuing education courses to help architects, specifiers, students, and construction industry professionals learn about glass design, specification, and production while receiving credits for continued education.

Project References
Explore the interactive Pilkington project references section, and find an array of inspiring projects using Pilkington glass in North America and around the world.

Resource Library
Take time to browse our online library where you'll find a wealth of resources, including our online Architectural Product Catalog, warranty information, full performance data, LEED information and much more.

ATS Technical Bulletins
Browse our extensive catalog of ATS Technical Bulletins online for comprehensive information on our cleaning, handling, inspecting and fabricating our products. You'll also find helpful information on specific glazing topics.

Toronto City Hall
Ontario, Canada
Pilkington **Eclipse Advantage**™ Grey

Pilkington Brand Products

Solar Control

Thermal Insulation

Fire Protection

Noise Control

Self-Cleaning

Decoration

Glass Systems

Special Applications

Solar Energy

Technical Bulletins

ATS 141
Glazing Choice Can Affect Fading of Home Furnishings

Pilkington **Optifloat**™ Tints

Pilkington tinted glasses reduce unwanted heat gain while admitting high natural daylight to enhance visual performance and lower artificial lighting needs. Available in Green, Blue-Green, Bronze, Grey and as Pilkington **Graphite Blue**™.

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.

Pilkington High Performance Tints

This line of tints provide 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**™*
  An uncoated tinted float glass with high daylight transmittance and solar control, offers 20 percent better solar performance than other green tints, with reduced glare and UV.

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

- Pilkington **SuperGrey**™*
  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.

Features and Benefits

- Range of color choices.
- Low external and internal reflectance.
- Solar control, reducing the need for air conditioning.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Available in a wide range of sizes from 3 mm to 12 mm thicknesses (depending on the color).

Applications

- Low, mid and hi-rise buildings
- Medical/Hospital
- Educational/Schools
- Office
- Retail

* Denotes a High Performance Tinted Glass

Holland Hospital
Holland, Michigan
Pilkington **Arctic Blue**™

Golf Club – Dubai
Pilkington **Arctic Blue™**
Pilkington **Energy Advantage™**
Photograph Compliments of Intraco

The Huntington Center
Toledo, Ohio
Pilkington **Solar-E**™ Clear

Technical Bulletins

ATS 133
Machine Cleaning Low-e

ATS 143
Hand Cleaning Low-e

ATS 148
Plant Growth Behind Low-e

ATS 162
Single Glazing
Pilkington **Solar-E**™

ATS 163
Handling, Inspecting,
and Fabrication

ATS 164
How Pilkington **Solar-E**™
Works

ATS 190
Handling, Inspection, and
Fabrication

Pilkington **Solar-E**™ solar control low-e glass

A superior low-e coating, Pilkington **Solar-E**™ is the perfect solution for meeting cooling load requirements and other energy code programs. Pilkington **Solar-E**™ offers natural daylight transmittance, energy conservation, and contributes to the sustainability of your project.

Features and Benefits

- The low-e coating reduces the emissivity of glass and lowers the U-factor.
- Low SHGC values can result in significant savings in utility costs.
- Available in natural colors, without reflectivity.
- Low UV (ultraviolet) transmittance. Reducing UV rays means less fading.
- Can help to achieve LEED® or other green certifications.
- For further improved thermal control, add Pilkington **Energy Advantage**™ low-e to an insulated unit (coating on the #4 surface).

Available Colors

- Clear
- EverGreen

Applications

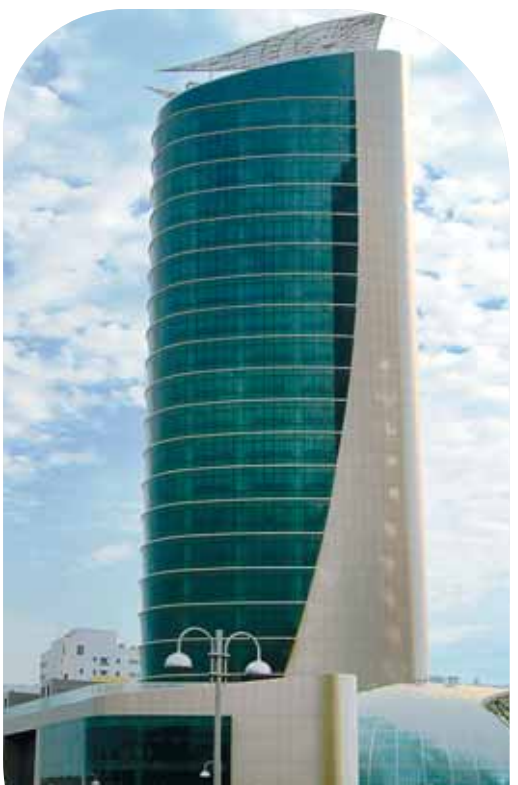
- Commercial buildings requiring solar and thermal control
- Low, mid and hi-rise buildings
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential

Manufactured using a unique chemical vapor deposition method, Pilkington **Solar-E**™ 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.

Available Thickness

- 3.2 mm (1/8″)*
- 4 mm (5/32″)*
- 5 mm (3/16″)*
- 6 mm (1/4″)
- 8 mm (5/16″)

* Only available in Clear



Wafra Mall
Kuwait
Pilkington **Solar-E**™ Blue-Green

Pilkington **Solar-E**™ Plus solar control low-e glass

The new Pilkington **Solar-E**™ Plus coating offers the same benefits and pyrolytic advantages as our classic low-e coating, with enhanced solar and thermal control and richer transmitted color.

Pilkington **Solar-E**™ Plus offers natural daylight transmittance, energy conservation, and contributes to the sustainability of your project. It can help achieve LEED® or other green certification.

Manufactured using a unique chemical vapor deposition method, Pilkington **Solar-E**™ Plus 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 a virtually unlimited shelf-life. In addition, no edge deletion or special handling is required.

Pilkington Low-e 4th Surface Technology
See page 21 for information on how Pilkington Low-e 4th Surface Technology can enhance the performance of Pilkington **Solar-E**™ Plus.

Available Thickness
- 6 mm (1/4")
- 8 mm (5/16")

Available Colors
- Blue-Green
- Arctic Blue
- Grey

Features and Benefits
- The low-e coating reduces the emissivity of glass and lowers the U-factor.
- Low SHGC values can result in significant savings in utility costs.
- Available in natural colors, without reflectivity.
- Provides good visible light transmittance, helping to reduce the need for interior lighting.
- Low internal and external reflection, reducing uncomfortable glare from the sun and diminishing the need for blinds and shades.
- Low UV (ultraviolet) transmittance. Reducing UV rays means less fading.
- Ideal for new commercial construction and replacement applications.
- For further improved thermal control, add Pilkington **Energy Advantage**™ low-e to an insulated unit (coating on the #4 surface).

Telesure Headquarters
South Africa
Pilkington **Solar-E**™ Arctic Blue

Chamber of Commerce
Saudi Arabia
Pilkington **Solar-E**™ Arctic Blue

Pilkington **Eclipse Advantage**™ solar control low-e glass

Technical Bulletins

ATS 123
Thermal Stress

ATS 124
Spandrel Panel Glazing

ATS 176
Handling, Inspecting, Fabricating & Glazing

Pilkington **Eclipse Advantage**™ is the world's first reflective pyrolytic low-e glass. It is designed for buildings that require both solar control performance and the insulating benefits of a low-e coating.

Pilkington **Eclipse Advantage**™ is manufactured by the NSG Group 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.

Pilkington Low-e 4th Surface Technology
See page 21 for information on how Pilkington Low-e 4th Surface Technology can enhance the performance of Pilkington **Eclipse Advantage**™.

Available Colors
- Clear
- Grey
- Bronze
- Blue-Green
- EverGreen
- Arctic Blue

Available Thickness
- 6 mm (1/4")
- 8 mm (5/16")

Applications
- Commercial buildings requiring solar and thermal control
- Low, mid and hi-rise buildings
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential

Features and Benefits
- The low-e coating reduces the emissivity of glass and lowers the U-factor.
- Low SHGC values can result in significant savings in utility costs.
- Available in natural, colors with subtle reflectivity.
- Provides good visible light transmittance, helping to reduce the need for interior lighting.
- Low internal and external reflection, reducing uncomfortable glare from the sun and the need for blinds and shades.
- Low UV (ultraviolet) transmittance. Reducing UV rays means less fading.
- Ideal for new commercial construction and replacement applications.
- For further improved thermal control, add Pilkington **Energy Advantage**™ low-e to an insulating unit (coating on the #4 surface).

Alfardan Twin Towers
Doha, Qatar
Pilkington **Eclipse Advantage**™

Pilkington **Eclipse**™ Gold and Sunset Gold reflective solar control glass

Here's your golden opportunity to make your project stand apart from the rest. These stylish products balance daylight transmittance with solar and glare control.

Perfect as an accent color or to glaze an entire building, Pilkington **Eclipse**™ Gold and Pilkington **Eclipse**™ Sunset Gold offer any project a sense of distinguished style and elegance.

With good natural daylight transmittance, the Pilkington **Eclipse**™ Gold family enhances visual performance and lowers artificial lighting requirements. Combine Pilkington **Eclipse**™ Gold or Pilkington **Eclipse**™ Sunset Gold with Pilkington **Energy Advantage**™ to improve the U-factor and further reduce solar heat gain coefficient.

The Pilkington **Eclipse**™ Gold family of products does not require edge deletion for insulating glass unit manufacture and can also have a ceramic frit or silk screen pattern applied to the coated surface. The products will not oxidize or change color over time.

Available Thickness

- 6 mm (1/4")
- 8 mm (5/16") Pilkington **Eclipse**™ Gold only

Features and Benefits

- Good daylight transmittance.
- Suitable for monolithic use or use within an insulated glass unit (#2 surface).
- Reduced lead times.
- Virtually unlimited shelf-life.
- Durable pyrolytic surface - can be handled, cut, insulated, laminated, heat-strengthened, tempered and bent using standard techniques.

Applications

- Commercial buildings
- Low, mid and hi-rise buildings
- Financial institutions/banks
- Office and retail
- Medical/Hospital
- Interior designs

(Note: Laminating with the coating touching the pvb interlayer will reduce reflectivity and increase transmittance.)

Alsalata Twin Towers
Doha, Qatar
Pilkington **Eclipse**™ Gold

FireKeepers Casino
Battle Creek, Michigan
Pilkington **Eclipse Advantage**™
Pilkington **Eclipse**™ Sunset Gold

Manchester United Training Ground
Manchester, UK
Pilkington **Optifloat**™ Clear

Pilkington **Optifloat**™ Clear glass

Technical Bulletins

ATS 144
Cleaning Clear and Tinted Glass

ATS 149
Interference Fringes

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.

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 8 mm (5/16") to 19 mm (3/4") 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.

Yale New Haven Hospital
New Haven, Connecticut
Pilkington **Optifloat**™ Clear
Pilkington **Planar**™

Features and Benefits

- Clear glass to maximize 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 buildings
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential

Pilkington **Spacia**™ vacuum glazing

Pilkington **Spacia**™ offers the thermal performance of conventional double glazing in the same thickness as a single glass pane. It balances historical preservation with modern comfort and environmental requirements.

How it works

Pilkington **Spacia**™ is different than conventional double glazing. The air between the two panes of glass is extracted, creating a vacuum. It offers the same thermal performance as conventional double glazing in one quarter of the thickness and two thirds the weight.

A vacuum, even a small one, is much more effective at minimizing conduction and convection heat losses, so the gap between the two panes can be reduced to just 0.2 mm, giving an overall thickness of just over 6 mm (1/4"). Heat flow through radiation is limited through one of the glass panes having a low-emissivity coating, similar to that used in modern conventional double glazing.

Pilkington **Spacia**™ is a double glazed unit with a low-e coating for improved thermal control.

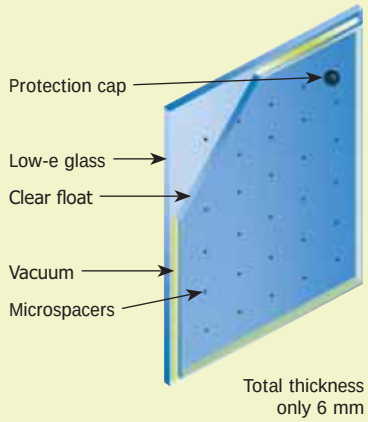
Pilkington **Spacia**™ Cool is a double glazed unit with a solar control low-e coating to reduce solar heat gain. This also provides an improved u-factor.

Pilkington **Spacia**™ 21 is a triple glazed "super window," consisting of two low-e coatings in the unit along with argon filling. The result is a highly energy efficient unit with a similar thickness to a conventional double insulating glass unit.

Applications

- Ideal for use in historic buildings
- Sliding windows
- Secondary glazing
- As one pane of a triple glazed "super-window"

Pilkington **Spacia**™
vacuum glazing unit construction



Features and Benefits

- Better thermal performance than modern double glazing in the same thickness as single glass, offering the opportunity to improve energy efficiency in older traditional buildings.
- Minimum disruption, can be retro-fitted into existing frames designed for single glazing.
- Cost effective method of improving the energy efficiency of older homes where glazing choice is restricted or where the original frames are a desirable feature.
- Improved acoustic performance over single glazing, enhancing the living and working environment.
- Has been successfully used in Japan for over fifteen years and is a proven solution.
- Significantly weighs less than traditional insulating glass units.

Archibald Place, Edinburgh, UK
Pilkington **Spacia**™ units

Pilkington **Energy Advantage**™ thermal control low-e glass

Technical Bulletins

ATS 133
Machine Cleaning Low-e

ATS 135
Handling, Inspection and Fabrication of Low-e

ATS 137-4
Improvements in Appearance of Low-e

ATS 138
How Low-e works

ATS 138D
Window Energy Efficiency with Multiple Low-e Coatings

ATS 143
Hand Cleaning Low-e

ATS 148
Plant Growth Behind Low-e

ATS 162
Single Glazing Low-e

ATS 193
4th Surface Technology

Pilkington **Energy Advantage**™ is the low-e glass of choice for residential and commercial applications in a heat dominated climate.

Pilkington **Energy Advantage**™ is one of the clearest and the most durable low-e technologies available today. With a scratch resistant surface, superior thermal performance, and high solar heat gain, it is an energy saving solution.

Pilkington **Energy Advantage**™ is known as a leading passive solar glazing product in the market. The pyrolytic low-e coating provides thermal insulation by reducing heat loss. Most sputter coated low-e products reflect solar infrared heat, lowering the solar heat gain and minimizing the benefits of passive solar heat.

The Pilkington **Energy Advantage**™ patented pyrolytic coating saves energy by allowing solar energy to pass through the glazing and enter into the home or building, while reducing heat loss.

Pilkington **Energy Advantage**™ is often referred to as a "passive solar" glass product because it allows much of the direct solar heat gain through the glazing. The passive solar energy easily passes through the high clarity glazing, providing free heat. To further improve thermal control, add a second low-e coating to the #4 surface of an insulating glass unit.

Available Thickness

- 2.5 mm (3/32")
- 3 mm (1/8")
- 4 mm (5/32")
- 5 mm (3/16")
- 6 mm (1/4")
- 8 mm (5/16")
- 10 mm (3/8")
- 12 mm (1/2")

Features and Benefits

- Enhanced clarity
- 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

Museum of the Earth
New York
Pilkington **Activ**™ Clear
Pilkington **Energy Advantage**™

Low-e 4th Surface Commercial Technology

Lower U-factor • Improved Clarity • Greater Energy Savings.

Here's how it works.

Pilkington **Energy Advantage**™ Low-e coatings applied to the #2 and #4 surfaces of an insulating unit reduce the center of glass U-factor by about 20%, compared to an IGU with a pyrolytic low-e and an uncoated clear lite. This proven technology improves thermal performance in a new or reglazed commercial building.

Durability is critical for coatings applied to the 4th surface of an insulating unit. Pyrolytic coatings are extremely durable and difficult to damage. Pilkington pyrolytic coating technology has been used on exposed surfaces successfully for over 20 years globally.

With superior clarity, unrivaled by any other pyrolytic glass, Pilkington **Energy Advantage**™ has been used for more than 10 years in North America as a 4th Surface Low-e product.

Enhanced thermal performance without investing in triple-pane windows.

- Fewer low-e products to inventory, with installation on #2 and #4 surfaces.
- No additional raw materials required.
- No additional capital investments necessary.
- Easily integrated into current fabrication process.
- Lighter construction.
- Less reflection than with triple glazing.
- Durability of a pyrolytic.
- No edge deletion required for an IGU.
- Easily handled, tempered, cut, bent, laminated, insulated and heat-strengthened
- Virtually unlimited shelf-life.

Pilkington **Energy Advantage**™ Low-e is coated using a pyrolytic process, which allows for the coating to be chemically-bonded to the glass at a molecular level. This process produces a coating which is extremely durable and will not scratch or degrade over time (under typical circumstances).

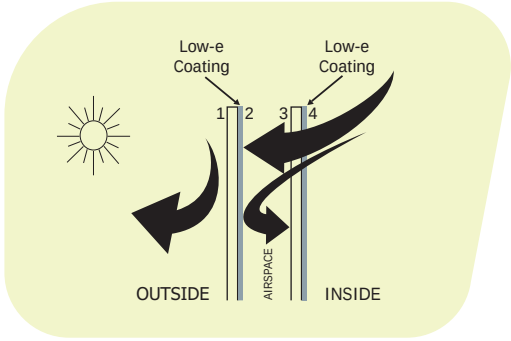
Features and Benefits

- Durability of a pyrolytic
- Low U-factor and reduced solar heat gain
- Superior thermal control
- Improved clarity
- High light transmittance
- Energy savings
- Easy to clean surface with standard techniques
- Superior aesthetics for any building
- Can help projects achieve LEED® credit
- No additional SKUs

How is glazing performance improved?

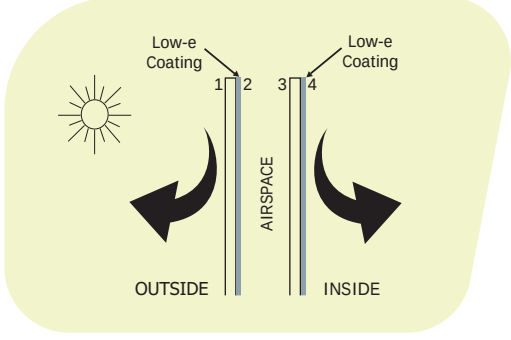
Cold Weather Conditions

The coating on the #2 surface reduces room heat (or far IR energy) loss by reflecting it back toward the space. By adding a second low-e coating to the #4 surface the thermal insulation is further improved. More infrared heat (room heat) is reflected back into the building.



Warm Weather Conditions

The low-e coating on the #4 surface reflects more solar heat than one lite of low-e glass, reducing cooling loads.



Pilkington **Pyrostop®** fire-resistant glass

Technical Information

For Technical Inquiries and Sales Information, please contact: Technical Glass Products (TGP) at (800)-426-0279

Specifically designed to provide high levels of fire protection, Pilkington **Pyrostop®** fire resistant glass offers a full range of properties traditionally associated with glass.

The Pilkington **Pyrostop®** range limits conductive and radiative heat transfer with product performances ranging from 20 to 120 minutes. These products must always be used as part of an approved fire resistance or fire protected framing assembly.

Martin Braun KG, Hannover, Germany
Pilkington **Pyrostop®**

Pilkington **Pyrostop®** consists of 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.

Features and Benefits

- Allows natural light and unobstructived views for fire rated walls, openings and doors.
- Reduces fire damage to property and valuables.
- Restricts the spread of heat, smoke, flames and hot gases.
- 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.
- Human impact safety rated category II.
- Available in short lead times for internal or external applications.
- Available with integral blinds.

Applications

- Interior and exterior glazing
- Low, mid and hi-rise buildings
- Medical/Hospital
- Educational/Schools
- Office
- Retail

Pilkington **Pyrostop®** is available through Technical Glass Products (TGP).
Please contact Technical Glass Products at (800)-426-0279 for further details.

Pilkington **Optiphon**™ acoustic control glass

Metropolitan, Warsaw, Poland
Pilkington **Optiphon**™

Acoustic insulation has become a very important topic with increasing traffic on the road, rail and in the air. Rather than a luxury, it is now essential, that noise reduction is considered in the specification of the glazing. With regard to employment law, comfort and medical necessity, noise insulation in building construction is an undisputed requirement to decrease stress- and noise-related illnesses.

Pilkington **Optiphon**™ is the ideal choice of glass in situations where there is excess noise from road, rail or air traffic, or various other sources, for example factories or nightclubs.

By using a special PVB (polyvinyl butyral) interlayer, Pilkington **Optiphon**™ is a high quality acoustic laminated glass that offers excellent noise reduction without compromising on light transmittance or impact performance.
The desired acoustic performance can be achieved through combining various thicknesses of glass with a PVB interlayer.

Features and Benefits

- Special PVB interlayer for enhanced sound insulation performance.
- A thinner and lighter glass for the equivalent acoustic performance.
- Available in jumbo and lehr end sizes.
- All products achieve at least safety class 1(B)1 (EN 12600).
- A high acoustic performance can be achieved when used in Insulating Glass Units (IGUs).
- Can also be used to improve noise insulation in a triple glazing construction.

Typical Noise Sources:

- Urban and highway traffic
- Railway traffic
- Aircraft (propeller and jet)
- Factory equipment
- Living activities (talking, music, radio, television)
- Children playing

Pilkington **Optiphon**™ can be combined with other Pilkington products for a multi-functional noise-reduction glass or a multi-functional noise-reduction IGU providing additional benefits, such as:

- Thermal insulation with Pilkington **Energy Advantage**™
- Solar control with Pilkington **Eclipse Advantage**™ (coating in position 2 in IGU)
- Self-cleaning with Pilkington **Activ**™ (coating in position 1 in IGU)

Technical Definitions

Sound Transmission Class (STC)
A single number rating for ranking sound reduction in decibels over the frequency range of 125-4000 Hz. Used for interior systems and focuses on sounds with a mid to high frequency.

Outdoor-Indoor Transmission Class (OITC)
A single number rating for ranking sounds reduction in decibels of the frequency range of 80-4000 Hz. Used for exterior walls and facade elements exposed to low frequency sounds.

ELE Headquarters
Gelsenkirchen, Germany
Pilkington **Activ**™
Pilkington **Optiphon**™

GE Plaza
Vancouver, British Columbia, Canada
Pilkington **Activ**™ Clear
Pilkington **Energy Advantage**™ low-e

Pilkington **Activ**™ self-cleaning glass

Technical Bulletins

ATS 166
Maintenance and Hand Cleaning of Pilkington **Activ**™

ATS 168
Handling, Inspection and Fabrication of Pilkington **Activ**™

ATS 169
Glazing Pilkington **Activ**™

A revolutionary glass that uses the power of the sun to clean itself. Pilkington **Activ**™ Clear and Blue can dramatically reduce or eliminate window cleaning, while providing crisp, clear vistas and an unspoiled exterior aesthetic.

Pilkington **Activ**™ 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 pyrolytic coatings are an integral part of the glass surface, they aren't susceptible to peeling, separation or disintegration over time. In addition, they are not damaged by liquid glass cleaners.

Combined in an insulating unit with an inboard lite of either Pilkington **Energy Advantage**™ low-e or Pilkington **Solar-E**™ low-e for excellent energy performance.

Watkins Residence
Adelaide, Australia
Pilkington **Activ**™ Clear

Available Colors

- Clear
- Blue (only available in 6 mm)

Available Thickness

- 3 mm (1/8")
- 4 mm (5/32")
- 6 mm (1/4")

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 buildings
- Medical/Hospital
- Educational/Schools
- Office
- Retail
- Residential

Office building of Bogdanka coalmine
Bogdanka, Poland
Pilkington **Activ**™ Blue

Pilkington Texture Glass

Technical Bulletins

ATS 158
Pilkington Texture Glass Strength

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

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 both windows and interiors.

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 obstruction and privacy, without sacrificing any natural light. Pilkington Texture Glass provides degrees of privacy through light diffusion and obstruction.

Visit **www.pilkington.us/texture** for available sizes and thicknesses.

Wide Range of Texture Options
Available in more than 20 different textures to suit almost any design need. Refer to the following page 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
- Creative Designs
- Multiple thicknesses available
- High light transmittance

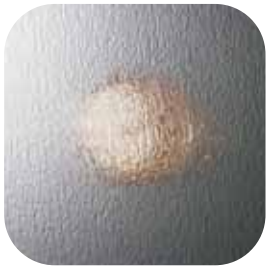
Applications
- Windows for privacy and decoration
- Shower and bath enclosures
- Interior partitions
- Door inserts
- Wall panels and wall features
- Furniture
- Backsplashes
- Exterior glazing


Arctic™


Autumn™


Chantilly™


Charcoal Sticks™

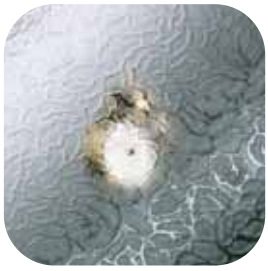

Contora™


Cotswold™


Digital™

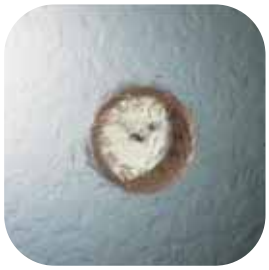

Everglade™


Flemish™


Florielle™


Mayflower™


Minster™

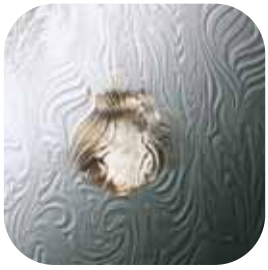

Oak™


Pelerine™


Reeded™


Stippolyte™


Sycamore™

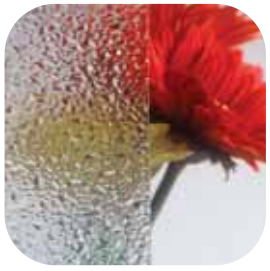

Taffeta™


Warwick™


Austral™


Morisco™


Rayado™


Sparkel™


Yacare™

West Midtown Ferry Terminal
New York City, New York
Pilkington **Planar**™

Technical Information

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

Pilkington **Planar**™

Pilkington **Planar**™ allows for glass systems that 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. The glass panels are individually fixed so there is no restriction on the height of the building which can be glazed.

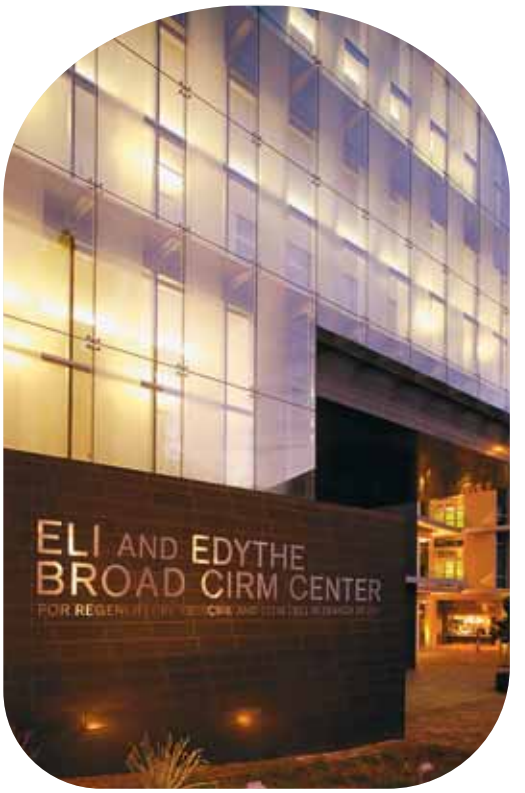
The specially engineered bushings, bolts and fittings are standard for all designs, while support components may be designed and fabricated to suit specific applications. A wide variety of Pilkington brand glass types are available in heat treated laminated glasses, providing options in appearance and 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. 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. Facades can be on any plane either vertical, horizontal or multi-angled.

By combining Pilkington **Planar**™ with the versatile range of products available from the NSG Group, 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



University of Southern California
Los Angeles, California
Pilkington **Planar**™, Pilkington **Optiwhite**™

Pilkington **Profilit**™ channel glass

Pilkington **Profilit**™ is a self-supporting glazing system of U-shaped channel 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.

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.

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

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.

Roof glazing above
European Arcade, Tychy, Poland
Pilkington **Profilit**™

Features and Benefits

- Available in channel lengths up to 23 feet.
- 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

Pilkington **OptiView**™ anti-reflective glass

Technical Bulletins

ATS 182
Hand Cleaning
Pilkington **OptiView**™

ATS 183
Handling, Inspection and Fabrication of
Pilkington **OptiView**™

ATS 184
Glass Selection and Design

Pilkington **OptiView**™ anti-reflective glass combines two proprietary pyrolytic surfaces into 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 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 anti-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, but it's a practical and economic choice for insulated units.

The Pilkington **OptiView**™ coating contains emissivity properties that provide a U-factor comparable to that of an insulated glass unit with our thermal performance low-e.

Available Thicknesses*

- 6.8 mm laminated lites
- 8.8 mm laminated lites
- 12.8 mm laminated lites
- 20.8 mm laminated lites

Features and Benefits

- Reduces exterior and interior visible light reflectance to less than 2 percent.
- Transmits more than 90 percent visible light.
- Low emissivity properties and thermal insulation when installed in an IGU.
- Superior safety, security and acoustic performance.
- Blocks more than 99 percent of transmitted UV.
- Durable pyrolytic surface that is bendable and temperable.
- May be laminated with a middle layer of Pilkington **Optiwhite**™ to create thicker laminated lites.
- Available in low iron.

Applications

- Retail storefronts
- Displays
- Museums
- Showrooms
- Stadiums
- Zoo/Exhibitions
- Digital Signage

President's House
Philadelphia, PA
Pilkington **OptiView**™

* Thickness of laminated monolithic Glass = thickness of glass layer + thickness of pvb + thickness of glass layer

- 6.8 mm Pilkington **OptiView**™ Laminated Single Glass = 3 mm Pilkington **OptiView**™ (#1) + 0.8 mm clear pvb layer + 3 mm Pilkington **OptiView**™ (#4)
- 8.8 mm Pilkington **OptiView**™ Laminated Single Glass = 4 mm Pilkington **OptiView**™ (#1) + 0.8 mm clear pvb layer + 4 mm Pilkington **OptiView**™ (#4)
- 12.8 mm Pilkington **OptiView**™ Laminated Single Glass = 6 mm Pilkington **OptiView**™ (#1) + 0.8 mm clear pvb layer + 6 mm Pilkington **OptiView**™ (#4)
- 20.8 mm Pilkington **OptiView**™ Laminated Single Glass = 10 mm Pilkington **OptiView**™ (#1) + 0.8 mm clear pvb layer + 10 mm Pilkington **OptiView**™ (#4)

Pilkington **OptAR**™ Plus anti-reflective glass

Pilkington **OptAR**™ Plus is a high performance, anti-reflective glass for use in computer screens, aircraft transparencies, televisions, flat panels, and as the cover glass of digital displays . It is ideally suited for projected capacitive and other touch screen technologies. This high performance glass reduces reflection to ~0.7% from the coated surface, while providing high light transmittance. As a result, visual acuity is increased and displays are easier to read.

Applications

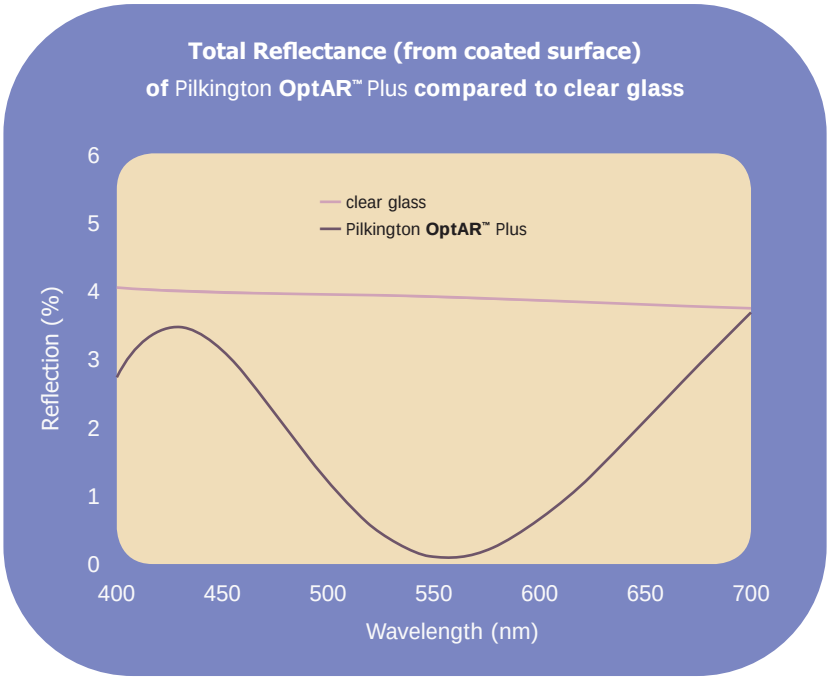
- Digital displays
- Aircraft transparencies
- Touch screens
- Flat-panel LCD monitors
- Televisions and HDTV
- Specialty vehicle windshields and instrument panels
- Specialty electronic applications

Available Thickness

- 1.6 mm (1/16")
- 3.2 mm (1/8")
- 4.0 mm (5/32")
- 6.0 mm (1/4")

Features and Benefits

- High light transmission: 94% on 3.2 mm clear glass
- Low reflection ~0.7% from coated surface
- Large sizes available: 130″×204″
- Easy installation and design flexiblity
- Tempered or laminated
- Available on low iron glass



Pilkington **Mirropane**™ one-way mirror

Technical Bulletins

ATS 125
Pilkington **Mirropane**™
Guidelines

ATS 180
Hand Cleaning
Pilkington **Mirropane**™

Pilkington **Mirropane**™ 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.

Available Thickness

- 6 mm (1/4")

Features and Benefits

- Durable pyrolytic surface
- Post heat-treatable
- High reflectivity
- Excellent availabiliaty
- Ideal for surveillance
- Minimizes read-through

Applications

- Security
- Retail stores
- Supermarkets
- Airport security
- Workplace monitoring
- Banks or cash offices
- Medical facilities
- Computer rooms
- Child care facilities
- Marketing focus group monitoring
- Any area requiring observation

Pilkington **MirroView™** and Pilkington **MirroView™** 50/50

Pilkington **MirroView™** and Pilkington **MirroView™** 50/50 provide a highly reflective mirror coating on a clear substrate. They are ideal to give digital displays and video screens a modern, high-tech look.

Pilkington **MirroView™** is perfect for concealing digital displays and video screens for commercial and residential applications with low ambient light.

Pilkington **MirroView™** 50/50 offers the same qualities as the original product, yet it is designed for use in applications with high ambient light allowing for a wide range of uses.

When the screen is turned 'off' Pilkington **MirroView™** and Pilkington **MirroView™** 50/50 maintain a mirrored appearance while concealing the screen. When the screen is turned 'on' the screen image shows through.

Pilkington **MirroView™** and Pilkington **MirroView™** 50/50 have an natural, mirror-like appearance. In addition, both products have the capability to work with all touch screen technologies, including projected capacitive, while maintaining a smoother surface for a better touch experience.

Pilkington **MirroView™** and Pilkington **MirroView™** 50/50 are available in large stock sizes providing the ability to conceal multiple displays or cut down to a smaller, traditional mirror concealing a smaller screen. It can be easily handled, transported and processed, including tempering and laminating. Due to the durability of the pyrolytic coating, it does not degrade over time, which gives the product a virtually unlimited shelf-life.

Pyrolytic Coating Advantage

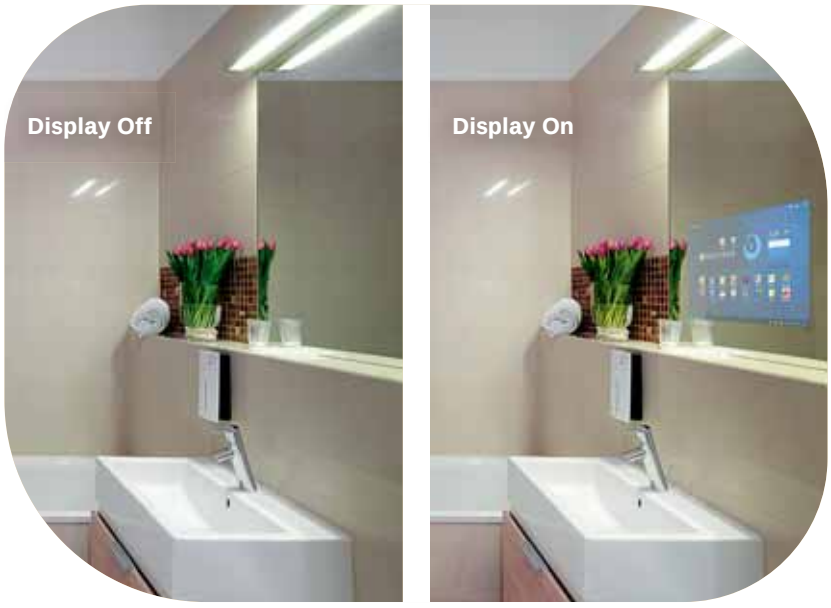
- Durable coating
- Easily handled and transported
- No edge deletion required
- Virtually unlimited shelf-life
- Inventoried locally
- Tempered and laminated

Applications

- Hotel rooms
- Lobbies and salons
- Retail
- Digital signage
- Touch screens
- Bars and restaurants
- Bathrooms
- Smart mirrors

Available Thickness

- 3.2 mm (1/8")
- 6.0 mm (1/4")



Technical Bulletins

ATS 187
Handling, Inspecting and Fabricating NSG **TEC**™ Glass

NSG **TEC**™ special applications glass

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 NSG **TEC**™ glass product to meet your specific performance requirements.

NSG **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. Virtually unlimited shelf-life.
- Will not change color over time.
- Scratch and abrasion resistant.
- 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 NSG **TEC**™ glass products to meet your specific needs, including:

NSG **TEC**™ 15
The best choice for applications requiring passive condensation control and thermal performance with low emissivity and clear color-neutral appearance.

NSG **TEC**™ 7
Offers the lowest resistivity value in the NSG **TEC**™ 7 Glass range. Combined with relatively low haze, it can be used for a wide range of applications including dye-sensitized solar cells, electromagnetic shielding and thin film photovoltaics.

NSG **TEC**™ 8
Designed for use specifically with amorphous silicon thin film photovoltaics. This product combines the low resistivity of NSG **TEC**™ 7 with a high haze coating required for good conversion efficiencies of amorphous silicon modules.

NSG **TEC**™ 35, 50, 70, and 250
For use in heated glass applications, these products combine thermal control with superior electro-optical properties.

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

Toledo Museum of Art Glass Pavillion™
Toledo, Ohio
Pilkington **Optiwhite**™

Pilkington **Optiwhite**™ low iron glass

Today the use of glass in architecture and design is becoming more and more prevalent, and Pilkington **Optiwhite**™ is at the very forefront of making it possible.

The reason for this is the sheer variety of benefits which Pilkington **Optiwhite**™ can offer, making it an excellent choice for a wide range of applications. Pilkington **Optiwhite**™ is an extra-clear, low iron float glass; it is practically colorless, and the green cast inherent to clear glasses is reduced. It is therefore ideal for use where glass edges are visible or where a neutral color is desired. As its light transmission is 1% and 8% higher than clear float glass in 3 mm to 19 mm thickness respectively, it is perfect for applications where transparency and purity of color are desired.

Available Thickness

- 3 mm (1/8")
- 4 mm (5/32")
- 5 mm (3/16")
- 6 mm (1/4")
- 8 mm (5/16")
- 10 mm (3/8")
- 12 mm (1/2")
- 15 mm (5/8")
- 19 mm (3/4")

Features and Benefits

- High light transmittance for true color and outstanding visual clarity when an unrestricted view is required.
- Purity of color with minimum color cast when viewing through the glass, ensuring a true representation of the designer's vision.
- Ensures a more natural, brighter view.
- Improves aesthetics of laminated glass.
- Provides less greenish color of the glass edges.
- High solar heat transmittance providing passive solar gain to allow more heat through, which can save costs on energy bills during the winter.
- Can be heat treated for safety and laminated for security.
- Can be painted or silk-screened for spandrel or decorative applications.
- Can be combined with other products from the Pilkington range to provide additional benefits.

Applications

- 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.

Technical Bulletins

ATS 160
Tempering
Pilkington **Optiwhite**™

Boutique Ermenegildo Zegna
Santiago, Chile
Pilkington **Optiwhite**™

NSG **TEC**™ – Photovoltaics

Thin Film Photovoltaic Applications

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

The NSG Group 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.

NSG 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.

The NSG Group manufacturing 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 in any of the following technologies:

- NSG **TEC**™ A7 silicon (a-Si)
- NSG **TEC**™ TIIX hybrid (a-Si/microcrystalline Si)
- NSG **TEC**™ C15 cadmium telluride

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

NSG **TEC**™ – Photovoltaics

NSG **TEC**™ range of products offers an excellent choice of Transparent Conductive Oxide glass for various thin film photovoltaic technologies. The range is specifically tuned to meet all requirements of the thin film photovoltaic industry in terms of conductivity, light transmittance, light trapping and cost effectiveness.

All our NSG **TEC**™ products are manufactured using a patented chemical vapor deposition process to produce a durable, on-line pyrolytic coating that may be heat strengthened or fully tempered, providing complete flexibility for module production. In addition, properties such as conductivity (sheet resistance), light scattering (haze) and light transmittance can be optimized to meet individual customer requirements, whatever the technology. Our products are available in either standard or low iron glass composition depending on the substrate/coating combination. Each of our products within the range is targeted at a particular thin film photovoltaic technology.

Features and Benefits

- High light transmittance, medium to high conductivity, low to high haze performance to suit all thin film photovoltaic applications.
- Coating properties remain durable under high fabrication temperatures. The coating is unaffected by very high processing temperature.
- Can be fully tempered/toughened or heat strengthened without damage to the coating or drop in performance.
- Available on standard clear or low iron glass, depending on the coating type.
- Durable on-line pyrolytic coating, making the product easy to transport, store, handle and process, reducing costs and lead times.
- Virtually unlimited shelf-life.

Source: Kaneka, Visola

Warranty Information

Pilkington North America Inc.
Architectural Glass Warranties

This warranty covers Pilkington **Activ**™, Pilkington **Arctic Blue**™, Pilkington **Energy Advantage**™, Pilkington **Eclipse Advantage**™, Pilkington **Eclipse**™, Pilkington **EverGreen**™, Pilkington **Mirropane**™, Pilkington **MirroView**™, Pilkington **MirroView**™ 50/50, Pilkington **Optifloat**™ Clear and Tinted Glass, Pilkington **OptAR**™, Pilkington **OptiView**™, Pilkington **Optiwhite**™, Pilkington **Solar-E**™, Pilkington **Solar-E**™ Plus, Pilkington **SuperGrey**™, NSG **TEC**™, Pilkington Texture Glass and all other PILKINGTON NORTH AMERICA INC. ("PNA") tinted, clear and pyrolytically coated float glass products.

601 Massachusetts Avenue
Washington DC
Pilkington **Planar**™
Pilkington **Optiwhite**™

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 C 1036 and/or EN 572 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 Pilkington **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 Pilkington **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 Pilkington **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, the 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.

Al Noor – Doha
Pilkington **Eclipse Advantage**™
Photograph Compliments of Intraco

Performance Data

Monolithic Glass Standards and Sizes

Quality Levels	Nominal Glass Thickness		Approximate Weight[4]		Thickness Tolerance Range[1]				Maximum Standard Size[2][3]	
					in.		mm		in.	mm
	in.	mm	lb/ft²	kg/m²	min.	max.	min.	max.		
Pilkington **Optifloat**™ Clear, Pilkington **Activ**™, Pilkington **Energy Advantage**™, Pilkington **Solar-E**™ Plus, Pilkington **OptiView**™*, and Pilkington **OptAR**™										
Q3	3/32	2.5	1.2	6	0.085	0.101	2.16	2.57	96×130	2438×3302
	1/8	3	1.6	8	0.115	0.134	2.92	3.40	102×130	2591×3302
	5/32	4	2.1	10	0.149	0.165	3.78	4.19	130×180	3302×4572
Q1/Q3	3/16	5	2.5	12	0.180	0.199	4.57	5.05	130×204	3302×5182
Q2/Q3	1/4	6	3.1	15	0.219	0.244	5.56	6.20		
Pilkington **Optifloat**™ Heavy Clear, Pilkington **Energy Advantage**™**, and Pilkington **Solar-E**™***										
Q3	5/16	8	4.1	20	0.292	0.332	7.42	8.43	130×204	3302×5182
	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	130×204	3302×5182
Pilkington **Optifloat**™ Heavy Clear,										
Q3	5/8	16	8.2	40	0.595	0.656	15.09	16.66	130×204	3302×5182
	3/4	19	9.9	48	0.719	0.781	18.26	19.84		
Pilkington **Optifloat**™ Heavy Grey or Bronze,										
Q3	5/16	8	4.1	20.3	0.303	0.327	7.70	8.30	130×204	3302×5182
	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	130×204	3302×5182
Pilkington **Optifloat**™ Grey or Bronze,										
Q3	1/8	3.2	1.6	8.0	0.115	0.134	2.92	3.40	102×130	2591×3302
	3/16	5	2.6	12.7	0.189	0.205	4.80	5.20	130×204	3302×5182
	1/4	6	3.1	15.2	0.228	0.244	5.80	6.20	130×204	3302×5182
Pilkington **Optifloat**™ Heavy Blue-Green,										
Q3	5/16	8	4.1	20.3	0.303	0.327	7.70	8.30	130×204	3302×5182
	3/8	10	5.2	25.4	0.382	0.406	9.70	10.30		
Pilkington **Optifloat**™ Blue-Green****, Green, Pilkington **EverGreen**™, Pilkington **Graphite Blue**™, and Pilkington **SuperGrey**™										
Q3	1/8	3.2	1.6	8.0	0.115	0.134	2.92	3.40	102×130	2591×3302
	3/16	5	2.6	12.7	0.189	0.205	4.80	5.20	130×204	3302×5182
	1/4	6	3.1	15.2	0.228	0.244	5.80	6.20	130×204	3302×5182
Pilkington **Arctic Blue**™ High Performance Tint										
Q3	5/32	4	2.1	10.1	0.150	0.165	3.80	4.20	130×180	3302×4572
	1/4	6	3.1	15.2	0.228	0.244	5.80	5.80	130×204	3302×5182
	3/8	10	5.2	25.4	0.382	0.406	9.70	10.30	130×204	3302×5182
Pilkington **Eclipse Advantage**™, Pilkington **Mirropane**™ and Pilkington **MirroView**™										
Q3	1/4	6	3.1	15.2	0.228	0.244	5.80	6.20	130×204	3302×5182
Pilkington **Optiwhite**™										
Q3	1/8	3.2	1.6	8.0	0.115	0.134	2.92	3.40	96x130	2438x3302
	3/16	5	2.5	12	0.180	0.199	4.57	5.05	130×204	3302×5182
	1/4	6	3.1	15.2	0.219	0.244	5.56	6.20		
	5/16	8	4.1	20.3	0.292	0.332	7.42	8.43		
	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		
		15	7.8	38.0	0.570	0.610	14.48	15.49		
	3/4	19	9.9	48.2	0.719	0.781	18.26	19.84		
Pilkington Texture Glass (all products except as noted below)										
EN 572-5	5/32	4	2.1	10.1	0.143	0.172	3.62	4.37	52.0×84.0	1320×2140
	1/4	6	3.1	15.2	0.224	0.256	5.70	6.50		
Pilkington Texture Glass **Reeded**™										
EN 572-5	5/32	4	2.1	10.1	0.143	0.172	3.62	4.37	52.0×83.9	1320×2130
Pilkington Texture Glass **Austral**™ and **Morisco**™										
EN 572-5	5/32	4	2.1	10.1	0.143	0.172	3.62	4.37	63.0×98.0	1600×2500
Pilkington Texture Glass **Rayado**™, **Sparkel**™ and **Yacare**™										
EN 572-5	5/32	4	2.1	10.1	0.143	0.172	3.62	4.37	57.0×98.0	1450×2500
EN 572-5	3/16	5	2.6	12.7	0.173	0.213	4.39	5.42	63.0×98.0	1600×2500

[1] Per ASTM C 1036; with and the exception of Pilkington Texture Glass and 15mm Pilkington **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.

Coated glasses meet quality level of ASTM C 1376

* Pilkington **OptView**™ is not available in 3/32" (2.5 mm). ** The largest size for Pilkington **Energy Advantage**™ 1/2" (12 mm) is 130×204.

*** Pilkington **Solar-E**™ is not available in 1/2" (12 mm). **** Pilkington **Optifloat**™ Blue-Green: 1/8" (3.2 mm) and 3/16" (5 mm) are not standard products. Subject to availability.

Uncoated Monolithic Glass Performance Data[1)10)]

	Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]				
				Reflectance[4)]								Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
	in.	mm	Transmittance[3)]	Outside	Inside	Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	U.S. Summer*	U.S. Winter*	European[6)]**		
Pilkington **Optifloat**™ Clear													
	3/32	2.5	91	8	8	89	8	82	0.95	1.05	5.8	0.90	1.03
	1/8	3	91	8	8	88	8	80	0.94	1.04	5.8	0.89	1.02
	5/32	4	90	8	8	86	8	78	0.94	1.04	5.8	0.88	1.01
	3/16	5	89	8	8	80	7	65	0.93	1.03	5.7	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	5.6	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
Pilkington **Optiwhite**™ low iron													
	1/8	3	91	9	9	91	8	88	0.94	1.04	5.8	0.91	1.04
	5/32	4	91	9	9	90	8	87	0.94	1.04	5.8	0.91	1.04
	3/16	5	91	9	9	90	8	86	0.93	1.03	5.7	0.91	1.04
	1/4	6	91	9	9	90	8	85	0.93	1.02	5.7	0.90	1.04
	5/16	8	91	9	9	89	8	84	0.92	1.01	5.6	0.90	1.03
	3/8	10	91	9	9	88	8	83	0.91	1.00	5.6	0.89	1.03
	1/2	12	90	9	9	88	8	81	0.89	0.99	5.5	0.89	1.02
	5/8	15	90	9	9	86	8	77	0.88	0.97	5.4	0.88	1.01
	3/4	19	90	8	8	86	8	78	0.86	0.95	5.3	0.88	1.01
Pilkington **Optifloat**™ Tints													
Green	1/4	6	76	7	7	46	5	29	0.93	1.03	5.7	0.61	0.70
Blue-Green	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	5.6	0.57	0.66
	3/8	10	67	6	6	36	5	21	0.91	1.00	5.6	0.54	0.63
Bronze	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	5.7	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	5.6	0.57	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	0.48	0.55
Grey	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	5.7	0.62	0.71
	1/4	6	44	5	5	41	5	21	0.93	1.02	5.7	0.58	0.66
	5/16	8	33	5	5	31	5	14	0.92	1.01	5.6	0.51	0.59
	3/8	10	28	5	5	26	5	11	0.91	1.00	5.6	0.48	0.55
	1/2	12	19	4	4	17	4	7	0.89	0.98	5.5	0.42	0.49
Pilkington **Graphite Blue**™													
	1/4	6	61	6	6	54	6	37	0.93	1.02	5.7	0.67	0.77
	5/16	8	54	6	6	46	5	30	0.92	1.01	5.6	0.61	0.70
	3/8	10	47	5	5	39	5	25	0.91	1.00	5.6	0.57	0.65
Pilkington **EverGreen**™ High Performance Tint													
	1/8	3	76	7	7	49	6	27	0.94	1.04	5.8	0.63	0.72
	3/16	5	73	7	7	42	5	21	0.93	1.03	5.7	0.58	0.67
	1/4	6	66	6	6	33	5	14	0.93	1.02	5.7	0.53	0.60
Pilkington **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
	5/16	8	42	5	6	25	5	13	0.92	1.01	5.6	0.47	0.54
	3/8	10	41	5	5	21	5	13	0.91	1.00	5.6	0.45	0.52
Pilkington **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	5.7	0.38	0.44
	1/4	6	9	4	4	8	4	1	0.93	1.03	5.7	0.36	0.41

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – 1) - 10).

Coated Monolithic Glass Performance Data[1)10)]

	Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]				
	in.	mm	Transmittance[3)]	Reflectance[4)] Outside	Reflectance[4)] Inside	Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	U.S. Summer*	U.S. Winter*	European[6)]**	Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
Pilkington **Energy Advantage**™ thermal control low-e (coating on #2 surface)													
	3/32	2.5	84	11	11	75	11	67	0.50	0.66	3.7	0.77	0.89
	1/8	3	84	11	11	74	11	66	0.50	0.65	3.7	0.77	0.88
	5/32	4	84	11	11	73	11	64	0.50	0.65	3.7	0.76	0.87
	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	0.65	0.75
	1/2	12	79	10	11	56	8	42	0.49	0.63	3.6	0.63	0.73
Pilkington **Solar-E**™ solar control low-e (coating on #2 surface)													
Clear	1/8	3	60	8	9	46	8	48	0.50	0.66	3.7	0.54	0.63
	5/32	4	60	8	9	45	8	46	0.50	0.65	3.7	0.54	0.62
	3/16	5	60	7	9	44	7	44	0.50	0.65	3.7	0.53	0.61
	1/4	6	60	8	9	44	7	44	0.50	0.65	3.7	0.53	0.61
	5/16	8	59	8	9	42	7	41	0.50	0.64	3.7	0.52	0.59
	3/8	10	60	8	9	40	7	38	0.49	0.64	3.6	0.50	0.58
EverGreen™	1/4	6	45	6	9	20	5	8	0.50	0.65	3.7	0.35	0.40
	5/16	8	40	7	9	16	5	5	0.50	0.64	3.7	0.32	0.36
Pilkington **Solar-E**™ Plus solar control low-e (coating on #2 surface)													
Blue-Green	1/4	6	41	6	9	24	5	19	0.50	0.65	3.7	0.38	0.43
	5/16	8	39	6	9	21	5	15	0.50	0.65	3.7	0.35	0.41
Arctic Blue™	1/4	6	30	5	8	17	5	11	0.50	0.65	3.7	0.32	0.37
	5/16	8	27	6	8	14	5	9	0.50	0.65	3.7	0.30	0.35
Grey	1/4	6	24	5	9	19	5	12	0.50	0.65	3.7	0.34	0.39
	5/16	8	19	5	8	15	5	9	0.50	0.64	3.7	0.31	0.36
Pilkington **Eclipse Advantage**™ solar control low-e (coating on #2 surface)													
Clear	1/4	6	67	25	28	58	19	30	0.53	0.67	3.7	0.62	0.72
	5/16	8	66	25	28	55	17	29	0.53	0.67	3.7	0.60	0.69
Blue-Green	1/4	6	56	19	27	35	11	16	0.53	0.67	3.7	0.46	0.53
	5/16	8	53	17	27	30	10	13	0.53	0.67	3.7	0.42	0.48
EverGreen™	1/4	6	48	15	27	23	8	7	0.53	0.67	3.7	0.37	0.43
	5/16	8	43	13	27	18	7	4	0.53	0.67	3.7	0.34	0.39
Arctic Blue™	1/4	6	39	12	27	23	8	10	0.53	0.67	3.7	0.37	0.42
	5/16	8	32	10	27	17	7	7	0.53	0.67	3.7	0.33	0.38
Bronze	1/4	6	38	11	27	35	10	11	0.53	0.67	3.7	0.46	0.53
	5/16	8	31	9	26	28	8	8	0.53	0.67	3.7	0.41	0.47
Grey	1/4	6	32	10	27	29	8	10	0.53	0.67	3.7	0.42	0.48
	5/16	8	25	8	27	22	7	7	0.53	0.67	3.7	0.37	0.42
Pilkington **Eclipse**™ Gold (coating on #2 surface)													
	1/4	6	40	36	45	45	25	9	0.93	1.02	5.7	0.54	0.62
	5/16	8	40	34	44	42	23	8	0.92	1.01	5.6	0.53	0.61
Pilkington **Eclipse**™ Sunset Gold (coating on #2 surface)													
	1/4	6	24	16	44	30	12	3	0.93	1.02	5.7	0.48	0.55
Pilkington **Activ**™ self-cleaning (coating on #1 surface)													
Clear	1/8	3	84	15	15	80	12	49	0.94	1.04	5.8	0.82	0.95
	5/32	4	83	15	15	79	12	47	0.94	1.04	5.8	0.81	0.93
	1/4	6	82	15	15	75	12	44	0.93	1.02	5.7	0.79	0.90
Blue	1/4	6	49	14	9	32	11	14	0.93	1.02	5.7	0.50	0.57

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – [1) - 10)].

Laminated Monolithic Glass Performance Data[1)10)]

	Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]			Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
	in.	mm	Transmittance[3)]	Reflectance[4)] Outside	Reflectance[4)] Inside	Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	U.S. Summer*	U.S. Winter*	European**		
Pilkington **OptiView**™	1/4	6.8	92	1.7	1.7	70	4	<1	0.68	0.80	4.6	0.77	0.88
Clear Glass (non-laminated)	1/4	6	88	8	8	77	7	63	0.93	1.03	5.7	0.82	0.94
Pilkington **OptiView**™	5/16	8.8	90	1.7	1.7	67	4	<1	0.67	0.79	4.5	0.75	0.86
Clear Glass (non-laminated)	5/16	8	87	8	8	73	7	57	0.92	1.01	5.6	0.79	0.91
Pilkington **OptiView**™	1/2	12.8	88	1.7	1.7	62	3	<1	0.66	0.77	4.4	0.71	0.82
Clear Glass (non-laminated)	1/2	12	84	8	8	64	6	49	0.89	0.98	5.5	0.73	0.84

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

Clear float glass performance based on non-laminated, monolithic glass. (Note – all thicknesses are nominal)

Thickness of laminated glass = thickness of glass layer + thickness of pvb + thickness of glass layer
- 6.8 mm Pilkington **OptiView**™ Single Laminated Glass = 3 mm Pilkington **OptiView**™ (#1) + 0.8 mm clear pvb layer + 3 mm Pilkington **OptiView**™ (#4)
- 8.8 mm Pilkington **OptiView**™ Single Laminated Glass = 4 mm Pilkington **OptiView**™ (#1) + 0.8 mm clear pvb layer + 4 mm Pilkington **OptiView**™ (#4)
- 12.8 mm Pilkington **OptiView**™ Single Laminated Glass = 6 mm Pilkington **OptiView**™ (#1) + 0.8 mm clear pvb layer + 6 mm Pilkington **OptiView**™ (#4)

Double Laminated Insulating Glass Unit Performance Data[1)10)]

Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]						Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
								U.S. Summer*		U.S. Winter*		European**			
in.	mm	Transmittance[3)]	Reflectance[4)] Outside	Reflectance[4)] Inside	Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	Air	Argon	Air	Argon	Air	Argon		
Pilkington **OptiView**™ Outer Lite (Coating on #1 and #2 Surface) and Pilkington **OptiView**™ Inner Lite (Coating on #3 and #4 Surface)															
1/4	6.8	84	3	3	54	5	<1	0.33	0.30	0.33	0.30	1.9	1.7	0.66	0.76
5/16	8.8	81	3	3	50	5	<1	0.32	0.30	0.32	0.29	1.9	1.7	0.64	0.73
1/2	12.8	77	3	3	43	4	<1	0.32	0.29	0.32	0.29	1.9	1.7	0.59	0.68

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

An insulating unit consists of two lites of equal glass thickness.

Thickness of Double Laminated Insulating Glass = thickness of Single Laminated Glass layer + air space thickness + thickness of Single Laminated Glass layer
- 26.3 mm Pilkington **OptiView**™ Double Laminated Insulating Glass =
  6.8 mm Pilkington **OptiView**™ Single Laminated Glass + 12.7 mm airspace + 6.8 mm Pilkington **OptiView**™ Single Laminated Glass
- 30.3 mm Pilkington **OptiView**™ Double Laminated Insulating Glass =
  8.8 mm Pilkington **OptiView**™ Single Laminated Glass + 12.7 mm airspace + 8.8 mm Pilkington **OptiView**™ Single Laminated Glass
- 38.3 mm Pilkington **OptiView**™ Double Laminated Insulating Glass =
  12.8 mm Pilkington **OptiView**™ Single Laminated Glass + 12.7 mm airspace + 12.8 mm Pilkington **OptiView**™ Single Laminated Glass

Vacuum Glazing Performance Data

	Thickness (mm)	Visible Light[2)] (%)		Solar Energy[2)] (%)		U-Factor[5)]		Solar Heat Gain Coefficient[7)]
		Transmittance[3)]	Transmittance[3)]	Transmittance[3)]	Reflectance[4)]	U.S. Winter (Btu/hr.sq ft. °F)	European (W/sq m K)	
Pilkington **Spacia**™*	6.2	76	16	62	15	0.25	1.4	0.66
Pilkington **Spacia**™ Cool*	6.2	70	23	46	36	0.18	1.0	0.49
Pilkington **Spacia**™ Shizuka*	9.2	73	15	56	13	0.25	1.4	0.61
Pilkington **Spacia**™ 21 Thermal Control**	18.2	64	22	47	19	0.16	0.9	0.58
Pilkington **Spacia**™ 21 Solar Control**	18.2	59	25	37	27	0.15	0.7	0.46

***** Double glazed unit ****** Triple glazed unit

See page 51 for explanation of references – [1) - 10)].

Sound Control Performance Data

Nominal Glass Thickness		Thickness							
in.	mm	125	250	500	1000	2000	4000	STC	OITC
Monolithic Clear Glass									
1/4	6	18	23	30	35	27	32	30	28
5/16	8	20	24	29	34	29	37	32	29
3/8	10	23	26	32	31	32	39	34	32
Pilkington **Optiphon**™									
1/4	6.8	27	27	31	36	40	38	35	31
5/16	8.8	30	30	32	36	38	43	36	32
3/8	10.8	31	32	33	37	38	47	37	34
Pilkington **Spacia**™									
1/4	6.2	25	25	30	35	39	30	33	27
5/16	8.2	24	31	34	37	39	34	35	30
3/8	10.2	28	29	34	38	38	38	36	30
Pilkington **Spacia**™ Shizuka									
3/8	9.2	25	28	34	38	41	40	36	31

Laboratory measured to the ISO 140-3 standard. Monolithic, unlaminated clear glass tested.
Laboratory measured to the ASTM E90-09 standard. Other configurations are available through special order.

Insulating Glass Unit Performance Data[1)10)]

	Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]				
	in.	mm	Transmittance[3)]	Reflectance[4)] Outside	Reflectance[4)] Inside	Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	U.S. Summer*	U.S. Winter*	European[6)]**	Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
Pilkington Uncoated Float Glass outer lite and Pilkington **Optifloat**™ Clear inner lite													
Clear	3/32	2	83	15	15	79	14	70	0.51	0.48	2.8	0.82	0.94
	1/8	3	83	15	15	77	14	67	0.51	0.48	2.8	0.81	0.93
	5/32	4	82	15	15	75	14	64	0.50	0.48	2.8	0.79	0.91
	3/16	5	79	15	15	64	12	50	0.50	0.48	2.8	0.73	0.83
	1/4	6	78	15	15	61	12	47	0.50	0.47	2.8	0.71	0.81
Green	1/4	6	68	12	14	38	8	23	0.50	0.47	2.8	0.49	0.56
Blue-Green	1/4	6	67	12	14	39	8	26	0.50	0.47	2.8	0.50	0.58
Bronze	1/8	3	62	10	13	57	10	33	0.51	0.48	2.8	0.64	0.73
	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
Grey	1/8	3	55	9	13	52	9	31	0.51	0.48	2.8	0.59	0.68
	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
Pilkington **Graphite Blue**™	1/4	6	54	9	13	43	8	29	0.50	0.47	2.8	0.55	0.63
	5/16	8	47	8	13	35	7	23	0.49	0.47	2.8	0.48	0.55
Pilkington **EverGreen**™ High Performance Tint	1/8	3	70	12	14	43	8	24	0.51	0.48	2.8	0.52	0.60
	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
Pilkington **Arctic Blue**™ High Performance Tint	5/32	4	59	10	13	40	7	28	0.50	0.48	2.8	0.49	0.57
	1/4	6	47	8	13	27	6	17	0.50	0.47	2.8	0.40	0.46
	5/16	8	37	7	12	20	5	10	0.49	0.47	2.8	0.34	0.39
Pilkington **SuperGrey**™ High Performance Tint	1/8	3	23	5	12	20	5	6	0.51	0.48	2.8	0.33	0.38
	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	0.22	0.25

An insulating unit consists of two lites of equal glass thickness, and a 1/2 in. (12.7 mm) airspace.

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – [1) - 10)].

One-Way Mirror Performance Data

Product	Nominal Glass Thickness		Glass Substrate	Visible[2] Transmittance (%)	Visible[4] Reflectance Coated Side (%)	Visible[4] Reflectance Glass Side (%)	Recommended Light Ratio	Glaze Mirror coating toward
	in.	mm						
Pilkington **Mirropane**™	1/4	6	Grey	10	74	19	8:1 Subject-side:Observer-side	subject-side
Pilkington **MirroView**™	1/8	3	Clear	24	66	58	—	viewer side
	1/4	6	Clear	22	66	57	—	viewer side
Pilkington **MirroView**™ 50/50	1/8	3	Clear	39	50	47	—	viewer side
	1/4	6	Clear	37	50	46	—	viewer side

Typical values of Pilkington production are provided.
Visible data is based on laboratory spectrophotometric measurements weighted by the factors in W5_NFRC_2003.STD in LBNL Window 6.3 software.

Pilkington **Energy Advantage**™ **Low-e Insulating Glass Unit Performance Data**[1)10)]

	Nominal Glass Thickness		Visible Light[2] (%)			Solar Energy[2] (%)			U-Factor[5]						Solar Heat Gain Coefficient[7]	Shading Coefficient[8]
				Reflectance[4]					U.S. Summer*		U.S. Winter*		European**			
	in.	mm	Transmittance[3]	Outside	Inside	Transmittance[3]	Reflectance[4]	UV Transmittance[2]	Air	Argon	Air	Argon	Air	Argon		
Pilkington Uncoated Float Glass outer lite and Pilkington **Energy Advantage**™ low-e (coating on #3 surface) inner lite																
Clear	3/32	2.5	77	18	17	67	17	58	0.33	0.28	0.34	0.29	1.9	1.6	0.76	0.88
	1/8	3	77	17	17	66	17	55	0.33	0.28	0.34	0.29	1.9	1.6	0.75	0.87
	5/32	4	77	17	16	64	17	53	0.33	0.28	0.34	0.29	1.9	1.5	0.74	0.85
	3/16	5	74	17	17	55	15	41	0.33	0.28	0.33	0.29	1.8	1.5	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
Green	1/4	6	63	13	15	33	9	18	0.33	0.28	0.33	0.29	1.8	1.5	0.44	0.50
Blue-Green	1/4	6	62	13	15	34	9	21	0.33	0.28	0.33	0.29	1.8	1.5	0.46	0.52
Bronze	1/8	3	58	12	15	48	12	27	0.33	0.28	0.34	0.29	1.9	1.6	0.58	0.67
	3/16	5	49	10	15	38	10	19	0.33	0.28	0.33	0.29	1.8	1.5	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
Grey	1/8	3	52	10	15	43	10	26	0.33	0.28	0.34	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	1.8	1.5	0.45	0.51
	1/4	6	36	7	14	27	7	13	0.33	0.28	0.33	0.29	1.8	1.5	0.40	0.46
Pilkington **Graphite Blue**™	1/4	6	50	10	14	37	10	23	0.33	0.28	0.33	0.29	1.8	1.5	0.50	0.57
	5/16	8	44	9	14	30	8	18	0.33	0.28	0.33	0.28	1.8	1.5	0.44	0.50
Pilkington **EverGreen**™ High Performance Tint	1/8	3	65	14	16	37	9	20	0.33	0.28	0.34	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	1.8	1.5	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
Pilkington **Arctic Blue**™ High Performance Tint	5/32	4	55	11	15	34	8	23	0.33	0.28	0.34	0.29	1.9	1.5	0.44	0.50
	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
	5/16	8	35	7	14	17	6	8	0.33	0.28	0.33	0.28	1.8	1.5	0.29	0.33
Pilkington **SuperGrey**™ High Performance Tint	1/8	3	21	5	14	16	5	5	0.33	0.28	0.34	0.29	1.9	1.6	0.27	0.31
	3/16	5	10	4	14	7	4	2	0.33	0.28	0.33	0.29	1.8	1.5	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	0.16	0.18

An insulating unit consists of two lites of equal glass thickness, and a 1/2 in. (12.7 mm) airspace.

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – 1) - 10).

Pilkington **Energy Advantage™ Low-e Insulating Glass Unit Performance Data**[1)10)]

Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]						Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
			Reflectance[4)]					U.S. Summer*		U.S. Winter*		European[6)]**			
in.	mm	Transmittance[3)]	Outside	Inside	Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	Air	Argon	Air	Argon	Air	Argon		
Pilkington **Energy Advantage™** Low-e (coating on #2 surface) outer lite and Pilkington **Optifloat™** Clear inner lite															
3/32	2.5	77	17	18	67	16	58	0.33	0.28	0.34	0.29	1.9	1.6	0.70	0.81
1/8	3	77	17	17	66	16	55	0.33	0.28	0.34	0.29	1.9	1.6	0.69	0.80
5/32	4	77	16	17	64	15	53	0.33	0.28	0.34	0.29	1.9	1.5	0.69	0.79
3/16	5	74	17	17	55	14	41	0.33	0.28	0.33	0.29	1.8	1.5	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	0.59	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
1/2	12	67	15	16	39	11	27	0.32	0.28	0.32	0.28	1.8	1.5	0.53	0.61
Pilkington **Energy Advantage™** Low-e (coating on #2 surface) outer lite and Pilkington **Energy Advantage™** Low-e (coating on #4 surface) inner lite[9]															
3/32	2.5	72	18	19	60	17	47	0.25	0.22	0.26	0.23	1.6	1.4	0.66	0.76
1/8	3	72	18	19	58	17	46	0.25	0.22	0.26	0.23	1.6	1.3	0.65	0.75
5/32	4	71	18	19	57	17	44	0.25	0.22	0.26	0.23	1.6	1.3	0.64	0.74
3/16	5	69	18	19	49	15	33	0.24	0.21	0.26	0.23	1.6	1.3	0.59	0.68
1/4	6	68	17	18	47	14	29	0.24	0.21	0.26	0.23	1.5	1.3	0.58	0.66
5/16	8	66	17	18	42	13	26	0.24	0.21	0.26	0.23	1.5	1.3	0.54	0.62
3/8	10	64	16	17	38	12	23	0.24	0.21	0.26	0.22	1.5	1.3	0.51	0.59
1/2	12	63	16	18	36	11	24	0.24	0.21	0.26	0.23	1.5	1.3	0.49	0.57

An insulating unit consists of two lites of equal glass thickness, and a 1/2 in. (12.7 mm) airspace.

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – 1) - 10).

Pilkington **Solar-E™ and** Pilkington **Solar-E™** Plus **Insulating Glass Unit Performance Data**

	Nominal Glass Thickness		Visible Light[2] (%)			Solar Energy[2] (%)			U-Factor[5]						Solar Heat Gain Coefficient[7]	Shading Coefficient[8]
				Reflectance[4]					U.S. Summer*		U.S. Winter*		European[6]**			
	in.	mm	Transmittance[3]	Outside	Inside	Transmittance[3]	Reflectance[4]	UV Transmittance[2]	Air	Argon	Air	Argon	Air	Argon		
Pilkington **Solar-E™** outer lite (coating on #2 surface) and Pilkington **Optifloat™** Clear inner lite																
Clear	1/8	3	55	11	16	41	10	41	0.33	0.28	0.34	0.29	1.9	1.6	0.47	0.54
	5/32	4	55	10	16	40	9	39	0.33	0.28	0.34	0.29	1.9	1.6	0.46	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	10	15	35	9	33	0.33	0.28	0.33	0.29	1.8	1.5	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
EverGreen™	1/4	6	40	8	15	17	6	7	0.33	0.28	0.33	0.29	1.8	1.5	0.26	0.30
	5/16	8	35	8	15	14	6	4	0.33	0.28	0.33	0.29	1.8	1.5	0.23	0.27
Pilkington **Solar-E™** Plus outer lite (coating on #2 surface) and Pilkington **Optifloat™** Clear inner lite																
Grey	1/4	6	21	6	15	16	6	10	0.33	0.28	0.33	0.29	1.9	1.6	0.26	0.30
	5/16	8	17	6	14	12	5	7	0.33	0.28	0.33	0.29	1.8	1.5	0.23	0.26
Blue-Green	1/4	6	37	8	15	20	6	15	0.33	0.28	0.33	0.29	1.9	1.6	0.30	0.34
	5/16	8	34	7	15	17	6	12	0.33	0.28	0.33	0.29	1.8	1.5	0.27	0.31
Arctic Blue™	1/4	6	27	6	14	14	5	9	0.33	0.28	0.33	0.29	1.9	1.6	0.24	0.27
	5/16	8	24	6	14	12	5	7	0.33	0.28	0.33	0.29	1.8	1.5	0.22	0.25
Pilkington **Solar-E™** (coating on #2 surface) outer lite and Pilkington **Energy Advantage™** Low-e (coating on the #4 surface) inner lite[9]																
Clear	1/4	6	49	11	17	32	9	26	0.24	0.22	0.26	0.23	1.6	1.3	0.41	0.47
	5/16	8	48	11	17	29	9	23	0.24	0.21	0.26	0.23	1.5	1.3	0.40	0.45
EverGreen™	1/4	6	37	8	17	16	6	5	0.24	0.22	0.26	0.23	1.6	1.3	0.24	0.27
	5/16	8	33	8	17	12	6	3	0.24	0.21	0.26	0.23	1.5	1.3	0.21	0.24
Pilkington **Solar-E™** Plus (coating on #2 surface) outer lite and Pilkington **Energy Advantage™** Low-e (coating on the #4 surface) inner lite[9]																
Blue-Green	1/4	6	34	8	17	18	6	12	0.25	0.22	0.26	0.23	1.6	1.3	0.27	0.31
	5/16	8	32	7	16	15	6	9	0.24	0.22	0.26	0.23	1.6	1.3	0.24	0.28
Arctic Blue™	1/4	6	25	6	16	13	5	7	0.25	0.22	0.26	0.23	1.6	1.3	0.21	0.25
	5/16	8	22	6	16	11	5	5	0.24	0.22	0.26	0.23	1.6	1.3	0.19	0.22
Grey	1/4	6	20	6	17	14	6	8	0.25	0.22	0.26	0.23	1.6	1.3	0.23	0.26
	5/16	8	16	6	16	11	5	5	0.24	0.22	0.26	0.23	1.6	1.3	0.20	0.23

An insulating unit consists of two lites of equal glass thickness, and a 1/2 in. (12.7 mm) airspace.

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – [1)-10)].

Pilkington **Eclipse Advantage™ Insulating Glass Unit Performance Data**[1)10)]

	Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]						Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
	in.	mm	Transmittance[3)]	Reflectance[4)]		Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	U.S. Summer*		U.S. Winter*		European[6)]**			
				Outside	Inside				Air	Argon	Air	Argon	Air	Argon		
Pilkington **Eclipse Advantage™** (coating on #2 surface) outer lite and Pilkington **Optifloat™** Clear inner lite																
Clear	1/4	6	60	29	31	46	21	24	0.35	0.30	0.35	0.30	1.9	1.6	0.55	0.63
	5/16	8	58	29	30	42	20	21	0.34	0.30	0.34	0.30	1.9	1.6	0.53	0.60
Blue-Green	1/4	6	51	21	29	29	12	13	0.35	0.30	0.35	0.30	1.9	1.6	0.38	0.44
	5/16	8	47	19	29	24	10	10	0.34	0.30	0.34	0.30	1.9	1.6	0.34	0.39
EverGreen™	1/4	6	43	17	30	20	9	6	0.35	0.30	0.35	0.30	1.9	1.6	0.29	0.33
	5/16	8	38	15	29	15	8	4	0.34	0.30	0.34	0.30	1.9	1.6	0.25	0.29
Arctic Blue™	1/4	6	35	13	30	19	9	9	0.35	0.30	0.35	0.30	1.9	1.6	0.29	0.33
	5/16	8	29	11	29	14	7	6	0.34	0.30	0.34	0.30	1.9	1.6	0.25	0.28
Bronze	1/4	6	34	13	29	28	11	9	0.35	0.30	0.35	0.30	1.9	1.6	0.38	0.44
	5/16	8	28	10	28	21	9	6	0.34	0.30	0.34	0.30	1.9	1.6	0.33	0.38
Grey	1/4	6	29	10	29	23	9	8	0.35	0.30	0.35	0.30	1.9	1.6	0.34	0.39
	5/16	8	22	8	29	17	7	6	0.34	0.30	0.34	0.30	1.9	1.6	0.28	0.32
Pilkington **Eclipse Advantage™** (coating on #2 surface) outer lite and Pilkington **Energy Advantage™** Low-e (coating on #4 surface) inner lite[9]																
Clear	1/4	6	56	30	30	41	22	19	0.25	0.23	0.27	0.24	1.6	1.4	0.51	0.58
	5/16	8	55	29	30	37	20	17	0.25	0.23	0.27	0.24	1.6	1.4	0.48	0.55
Blue-Green	1/4	6	48	22	29	26	12	10	0.25	0.23	0.27	0.24	1.6	1.4	0.35	0.40
	5/16	8	44	20	29	21	11	8	0.25	0.23	0.27	0.24	1.6	1.4	0.30	0.35
EverGreen™	1/4	6	40	18	30	18	9	5	0.25	0.23	0.27	0.24	1.6	1.4	0.26	0.30
	5/16	8	36	15	29	14	8	3	0.25	0.23	0.27	0.24	1.6	1.4	0.23	0.26
Arctic Blue™	1/4	6	33	14	29	17	9	7	0.25	0.23	0.27	0.24	1.6	1.4	0.26	0.30
	5/16	8	27	11	29	13	7	5	0.25	0.23	0.27	0.24	1.6	1.4	0.22	0.25
Bronze	1/4	6	32	13	29	24	11	7	0.25	0.23	0.27	0.24	1.6	1.4	0.34	0.39
	5/16	8	26	10	28	19	9	5	0.25	0.23	0.27	0.24	1.6	1.4	0.29	0.33
Grey	1/4	6	27	11	29	20	9	7	0.25	0.23	0.27	0.24	1.6	1.4	0.30	0.35
	5/16	8	21	8	29	15	7	5	0.25	0.23	0.27	0.24	1.6	1.4	0.25	0.29

An insulating unit consists of two lites of equal glass thickness, and a 1/2 in. (12.7 mm) airspace.

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – [1) - 10)].

Coated Insulating Glass Unit Performance Data[1)10)]

	Nominal Glass Thickness		Visible Light[2)] (%)			Solar Energy[2)] (%)			U-Factor[5)]						Solar Heat Gain Coefficient[7)]	Shading Coefficient[8)]
				Reflectance[4)]					U.S. Summer*		U.S. Winter*		European**			
	in.	mm	Transmittance[3)]	Outside	Inside	Transmittance[3)]	Reflectance[4)]	UV Transmittance[2)]	Air	Argon	Air	Argon	Air	Argon		
Pilkington **Eclipse**™ (coating on #2 surface) outer lite and Pilkington **Optifloat**™ Clear inner lite																
Gold	1/4	6	36	38	45	35	27	7	0.50	0.47	0.47	0.45	2.8	2.6	0.45	0.52
	5/16	8	36	35	42	31	24	5	0.49	0.47	0.47	0.44	2.8	2.6	0.43	0.49
Sunset Gold	1/4	6	22	16	44	24	13	3	0.50	0.47	0.47	0.45	2.8	2.6	0.36	0.42
Pilkington **Eclipse**™ (coating on #2 surface) outer lite and Pilkington **Energy Advantage**™ Low-e (coating on #3 surface) inner lite																
Gold	1/4	6	34	38	42	30	28	5	0.33	0.28	0.33	0.29	1.8	1.5	0.41	0.48
	5/16	8	34	36	40	26	26	4	0.33	0.28	0.33	0.28	1.8	1.5	0.39	0.45
Sunset Gold	1/4	6	21	16	41	19	14	2	0.33	0.28	0.33	0.29	1.8	1.5	0.31	0.36
Pilkington **Activ**™ (coating on #1 surface) outer lite and Pilkington **Optifloat**™ Clear inner lite																
Clear	1/8	3	77	21	20	71	17	43	0.51	0.48	0.48	0.45	2.8	2.7	0.74	0.86
	5/32	4	76	21	20	69	17	41	0.50	0.48	0.48	0.45	2.8	2.7	0.73	0.84
	1/4	6	74	21	20	59	16	34	0.50	0.47	0.47	0.45	2.8	2.6	0.68	0.78
Blue	1/4	6	44	16	15	26	12	11	0.50	0.47	0.47	0.45	2.8	2.6	0.38	0.43
Pilkington **Activ**™ (coating on #1 surface) outer lite and Pilkington **Energy Advantage**™ Low-e (coating on #3 surface) inner lite																
Clear	1/8	3	72	23	21	60	20	36	0.33	0.28	0.34	0.29	1.9	1.6	0.69	0.80
	5/32	4	71	23	21	58	20	34	0.33	0.28	0.34	0.29	1.9	1.5	0.68	0.78
	1/4	6	69	23	20	51	19	27	0.33	0.28	0.33	0.29	1.8	1.5	0.64	0.74
Blue	1/4	6	40	17	16	22	12	9	0.33	0.28	0.33	0.29	1.8	1.5	0.33	0.38
Pilkington **Activ**™ (coating on #1 surface) outer lite and Pilkington **Solar-E**™ (coating on #3 surface) inner lite																
Clear	1/8	3	51	21	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
	1/4	6	50	21	13	34	19	24	0.33	0.28	0.33	0.29	1.8	1.5	0.60	0.69
Blue	1/4	6	30	16	11	15	12	8	0.33	0.28	0.33	0.29	1.8	1.5	0.31	0.36

An insulating unit consists of two lites of equal glass thickness, and a 1/2 in. (12.7 mm) airspace.

* U.S. U-Factor (Btu/hr.sq ft.°F) is based on NFRC/ASTM standards. ** European U-Factor (W/sq m K) is based on EN 410/673 (CEN) standard.

All performance values are center-of-glass values calculated using the LBNL Window 6.3 program. See page 51 for explanation of references – 1) - 10).

NSG **TEC™ Performance Data**

Product	Thickness (mm)	Visible Light Transmittance (%)	Sheet Resistance (Ohms/sq.)	Haze (%)	Hemispherical Emmitance
NSG **TEC™** Product Properties					
NSG **TEC™** 7	2.2, 3.0, 3.2	80-82	6-8	≤2	0.12
NSG **TEC™** 8	2.2, 3.2	80-81.5	7-9	12	0.12
NSG **TEC™** 10	2.2, 3.2, 4.0	83-84.5	9-11	≤1	0.13
NSG **TEC™** 15	1.3, 1.6, 1.8, 2.2, 3.0, 3.2	83-84.5	12-14	≤0.45	0.15
	4.0, 5.0, 6.0, 8.0, 10.0	82-83	12-14	≤0.74	0.15
NSG **TEC™** 20	4.0	83-84	19-25	≤0.65	0.22
NSG **TEC™** 35	3.2, 6.0	82-84	32-48	≤0.65	0.36
NSG **TEC™** 50	6.0	83-84	43-53	≤0.55	0.39
NSG **TEC™** 70	3.2, 4.0	82-84	58-72	≤0.55	0.48
NSG **TEC™** 100	3.2, 4.0	83-84	125-145	≤0.55	0.60
NSG **TEC™** 250	3.2, 4.0	84-85	260-325	≤0.70	0.67
NSG **TEC™** 1000	3.2	88	1000-3000	0.5	0.81

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

Glazing (Room/Cool Side)	Airspaces (Number)	U-Value (W/M² K)	Room-Side Glass Temp. (C)	Condensation RH[3] (%)	RH Improvement (%)	Heat Flow Through Glass (W/m²)	Heat Flow Reduction (%)	Power Density (W/m²)
NSG **TEC™** Refrigerator Door Applications[1]								
Clear/Clear	1	2.4	20	64	Base Case	54	Base Case	0
Triple Clear[4]	2	2.0	21	69	8	45	17	0
NSG **TEC™** 15/Clear	1	1.7	22	73	14	38	30	0
NSG **TEC™** Freezer Door Applications[2]								
Triple Clear[4]	2	1.9	15	48	Base Case	87	Base Case	0
NSG **TEC™** 70/Clear/Clear	2	1.7	24	81	70	82	6	82
NSG **TEC™** 70/NSG **TEC™** 15	1	1.6	25	87	82	75	14	82
NSG **TEC™** 70/NSG **TEC™** 15/clear	2	1.5	25	90	88	73	17	82

[1] Room-side temperature = 27°C, refrigeration temperature = 4°C.
[2] Room-side temperature = 27°C, freezer temperature = -20°C.
[3] 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.
[4] No power.

Notes: All glass 3.2 mm; Airspace 12 mm for doubles, 6mm for triples; Airspace filled with air; All simulations utilizing LBNL Window 6.3 program; Demist heater power of 100 Watts (82 W/m²); Input voltage = 120 volts; Units 800 mm × 1,700 mm, bus bars along 800 mm dimensions.

Performance Data Notes

1) Some combinations or installations may require heating 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 6.3 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 Window 6.3 program under NFRC 100-2010 environmental conditions. Winter U-Factors are based on an outdoor temperature of 0°F (-18°C), an indoor temperature of 70°F (21°C) and a 12.3 mph (5.5 m/s) wind velocity with no sun. Summer U-Factors are based on an outdoor temperature of 90°F (32°C), and indoor temperature of 75°F (24°C), a solar intensity of 248 Btu/hr.sq ft. °F. (783 W/sqm) and a 6.3 mph (2.8 m/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" (3 mm) clear glass at nominal 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×200+ Us×14. To obtain metric RHG (W/sq m), multiply by 3.154.

9) A low-e 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

Technical Bulletins

ATS 129
Properties

ATS 171
Optics and Window 5 Procedures

NSG GROUP

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