



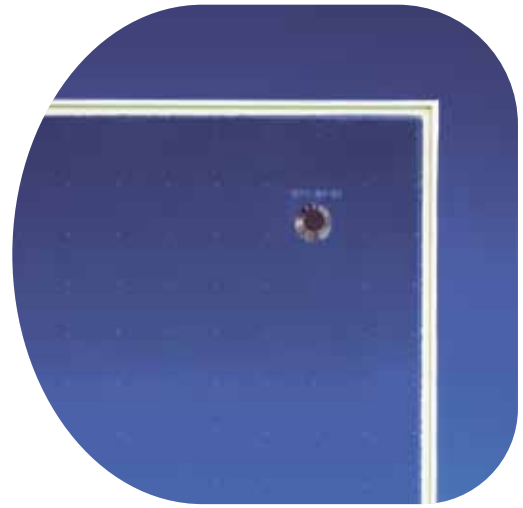
Vacuum Glazing
Pilkington **Spacia™**



Pilkington **Spacia™** vacuum insulating glazing

Pilkington **Spacia™** is the world's first commercially available vacuum glazing, with sales since 1997.

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.



New construction of 7 flats and a penthouse Penlu, Swanage-Wales

Approximately 90m² of Pilkington **Spacia™**

Benefits

- Energy efficiency without compromising the building aesthetics or design.
- Improved sound reduction performance when compared to a standard double glazed unit.
- An innovative method of improving the energy efficiency of older homes or commercial structures where glazing choice is restricted or where the original frames are a desirable feature.
- Custom sizes available
54" x 95" (1350 x 2400mm) maximum size,
8" x 14" (200 x 350mm) minimum size.
- Suitable for new buildings where the use of thinner, low weight glazing is desirable, such as sliding sashes.
- Proven technology; successfully used in Japan and other countries for over 15 years.
- Pilkington provides a ten year warranty to the installer.

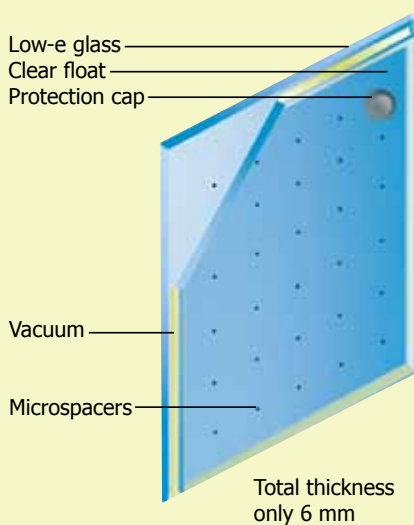


How it works

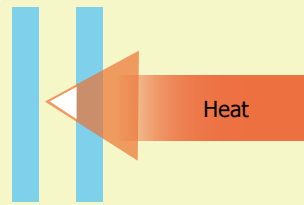
Pilkington **Spacia™** vacuum glazing consists of an outer pane of low-emissivity glass and an inner pane of clear float glass, separated by a microspacer grid of tiny pillars, each measuring 0.5 mm in diameter. The grid ensures that the panes are kept a fixed distance apart. The edges are welded to achieve a hermetic seal. Air is extracted to create a vacuum via the extraction point, rather than being filled with air or gas. The result is excellent thermal performance from a unit that is only slightly thicker than single glass.

A vacuum provides excellent thermal efficiency and if the pressure is low enough, it will eliminate the conductive and convective heat exchange between the two panes of glass. In a standard double glazed unit with a low-e coating, the conduction/convection component can result in 70% of the heat lost and so eliminating this loss is significant. The vacuum space provided between the two panes with Pilkington **Spacia™** significantly reduces thermal conduction and convection, and a low-e coating reduces thermal radiation.

Pilkington **Spacia™** vacuum glazing unit construction

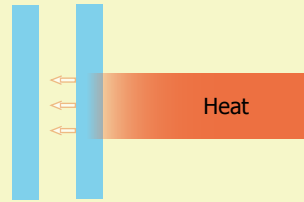


Heat Transfer System



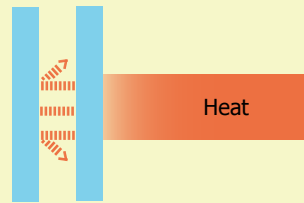
Thermal Conduction

"Conduction" is the transfer of heat through an object. Since heat does not transfer in a vacuum, conduction is significantly reduced.



Thermal Convection

"Convection" is the transfer of heat through fluid motion. Convection is significantly reduced in a vacuum in which no air or water exists.



Thermal Radiation

"Radiation" is the transfer of thermal energy generated from an object to another object. Low-e coatings reduce thermal radiation.

Applications

With a narrow overall thickness and good acoustic performance, Pilkington **Spacia™** is ideal for use in variety of building types. Various types of Pilkington **Spacia™** are available for a multitude of glazing solutions.

Pilkington **Spacia™** offers historic buildings the ability to maintain original design, while improving glazing performance. It may even allow the use of the original frames if these are in a reasonable or repairable condition.

Until now, the only choices were to sacrifice thermal performance and comfort, or to compromise the appearance of the building by using bulkier modern frames with double glazing.

- Ideal for use in historic buildings
- Secondary glazing
- As one pane of a triple glazed "super-window" (see Pilkington **Spacia™** 21 for more information)

Pilkington Spacia™ Product Lineup



The Hermitage Museum
Amsterdam
Approximately 900
Pilkington Spacia™ units

Pilkington Spacia™ includes many variations, including types designed for high thermal performance and others with enhanced sound and thermal performance.

Standard Pilkington Spacia™ is a double glazed unit with a low-e coating for improved thermal control. The vacuum space between two panes provides thermal insulation approximately four times greater than a single pane.

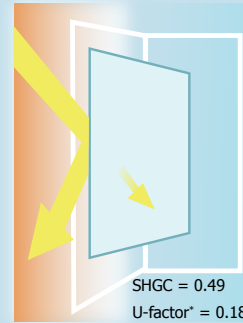
Pilkington Spacia™ helps to maintain room temperature and significantly reduces condensation resistance.

Pilkington Spacia™ Cool

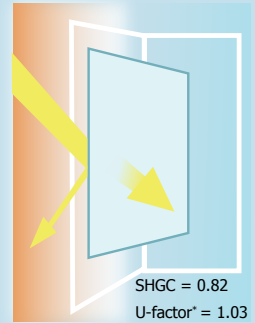
Pilkington Spacia™ Cool is a double glazed unit with a solar control low-e coating to reduce solar heat gain, which also provides an improved U-factor.

Pilkington Spacia™ Cool reduces solar heat gain and improves thermal insulation more than five times greater than uncoated monolithic strength glass. The solar control properties work to retain comfortable room temperatures.

Pilkington Spacia™ Cool



Monolithic Clear Glass



Figures demonstrate improved solar performance over clear glass.

* Btu/hr.sq ft. °F



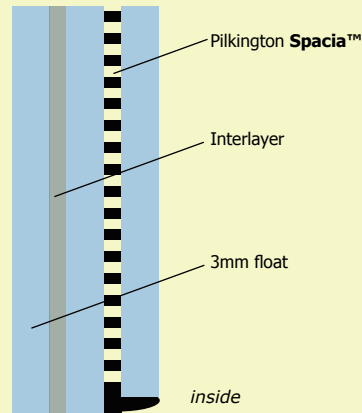
Pilkington Spacia™

Pilkington **Spacia™** provides sound insulation to block out noises generated inside and outside a room, creating the ultimate quiet environment.

Unit	STC
Pilkington Spacia™ 6.2 mm (unit constructed of 2mm & 3mm lites)	34
Pilkington Spacia™ 8.2 mm (unit constructed of 5mm & 3mm lites)	33
Pilkington Spacia™ 10.2 mm (unit constructed of 5mm & 5mm lites)	36

Frequency range: 100 - 5000 Hz

Pilkington Spacia™ Shizuka vacuum glazing unit construction



Pilkington Spacia™ Shizuka

Pilkington **Spacia™** Shizuka is double glazed unit with a laminated lite of clear glass for added safety performance and improved sound reduction. This unit provides thermal insulation and almost 100% UV absorption, regardless of its thin structure.

Unit	STC
Pilkington Spacia™ Shizuka 9.2mm (unit constructed of 2.5mm/3mm & 3mm lites)	36
Pilkington Spacia™ Shizuka 9.7mm (unit constructed of 3mm/3mm & 3mm lites)	37
Pilkington Spacia™ Shizuka 10.7mm (unit constructed of 4mm/3mm & 3mm lites)	37
Pilkington Spacia™ Shizuka 11.7mm (unit constructed of 5mm/3mm & 3mm glass)	38

Frequency range: 100 - 5000 Hz

Pilkington Spacia™ Shizuka Cool

Pilkington **Spacia™** Shizuka Cool offers the same sound performance as standard Pilkington **Spacia™** Shizuka, with added solar control performance. This double glazed, laminated clear glass unit has an added solar control low-e coating for excellent sound control and interior comfort.

The Hermitage Museum
Amsterdam
Approximately 900
Pilkington **Spacia™** units



Pilkington Spacia™ 21

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.



Archibald Place, Edinburgh
60 units of Pilkington **Spacia™**

Hybrid Glazing
Pilkington **Spacia™** 21
vacuum glazing unit
construction



*Spacer can be extra wide for thicker constructions

Pilkington **Spacia™** 21 is a hybrid vacuum glazing composed of Pilkington **Spacia™** vacuum glazing and low-e glass. The cavity is injected with argon gas that is lower in thermal conductivity by about 30% compared to air, thus achieving ultrahigh thermal insulation performance.

Pilkington **Spacia™** 21 is available with a solar control low-e coating for enhanced solar control. For improved thermal performance, krypton can be used in the airspace. Pilkington **Spacia™** 21 is also available in standard clear or green glass.

All Pilkington **Spacia™** 21 variations are available in 18.2 mm and 21.2 mm thicknesses.





	Thickness (mm)	Visible Light ²		Solar Energy ²		U-Factor ⁵		Solar Heat Gain Coefficient ⁷
		Transmittance ³ %	Reflectance ⁴ %	Transmittance ³ %	Reflectance ⁴ %	Europe (W/sq m K)	U.S. Winter (Btu/hr.sq ft. °F)	
Pilkington Spacia TM	6.2	76	16	61	15	1.4	0.25	0.66
Pilkington Spacia TM Cool	6.2	70	23	46	36	1.0	0.18	0.49
Pilkington Spacia TM Shizuka	9.2	73	15	56	13	1.4	0.25	0.61
Pilkington Spacia TM Cool Shizuka	9.2	68	22	42	29	1.0	0.18	0.46
Pilkington Spacia TM 21 Thermal Control	18.2	64	22	47	19	0.9	0.16	0.58
Pilkington Spacia TM 21 Thermal Control	21.2	64	22	47	19	0.8	0.14	0.58
Pilkington Spacia TM 21 Solar Control	18.2	59	25	37	27	0.7	0.15	0.46
Pilkington Spacia TM 21 Solar Control	21.2	59	25	37	27	0.7	0.14	0.46
Pilkington Spacia TM 21 Solar Control Green	18.2	58	19	29	40	0.8	0.14	0.34

*U.S. U-Factor (Btu/hr.sq ft. °F) is based on NFRC/ASTM standards - All performance values are center-of-glass values calculated by the LBNL Window 6.3 program

See Pilkington Architectural Product Guide for explanation of superscript references^{-1, 10} *All products are available in thicker forms if additional glass strength is required.

This publication provides only a general description of the product. Further, more detailed, information may be obtained from your local supplier of Pilkington products. It is the responsibility of the user to ensure that the use of this product is appropriate for any particular application and that such use complies with all relevant legislation, standards, codes of practice and other requirements. To the fullest extent permitted by applicable laws, Nippon Sheet Glass Co. Ltd. and its subsidiary companies disclaim all liability for any error in or omission from this publication and for all consequences of relying on it. Pilkington, "Spacia," "Optiwhite," "Solar-E," "Eclipse Advantage," and "Optifloat" are trademarks owned by Nippon Sheet Glass Co. Ltd, or a subsidiary thereof.



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