PILKINGTON

Vacuum Insulated Glazing

Pilkington **Spacia**™

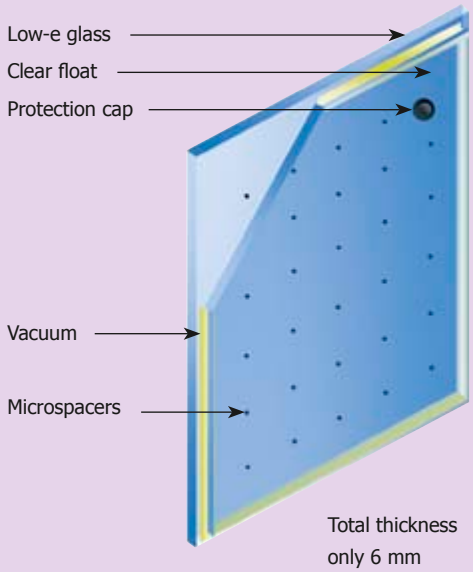
NSG GROUP

Pilkington **Spacia**™

Vacuum Insulating Glazing

Pilkington **Spacia**™ is the world's first commercially available vacuum glazing, offering the thermal performance of conventional double glazing in the same thickness as a single glass pane. Because of the thin profile, it is often a good fit for historic restoration projects as it balances historical preservation with modern comfort and environmental requirements.

Pilkington **Spacia**™ vacuum glazing unit construction



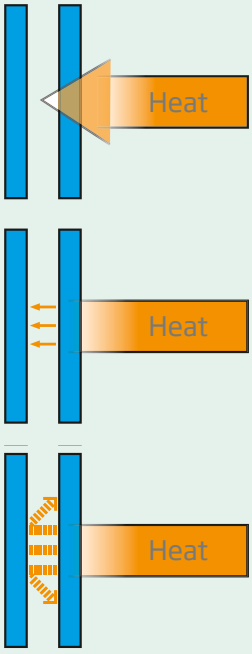
How it is made

Pilkington **Spacia**™ is different than conventional double glazing. While it does consist of an outer pane of low-emissivity glass and an inner pane of clear float glass, instead of leaving a gap for air or argon, the air between the two panes of glass is extracted creating a vacuum and leaving a space of only 0.2 mm. To maintain this space, the two panes are 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. The result is excellent thermal performance from a unit that is only slightly thicker than single glass.

How it works

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.

Types of heat transfer



Thermal Conduction

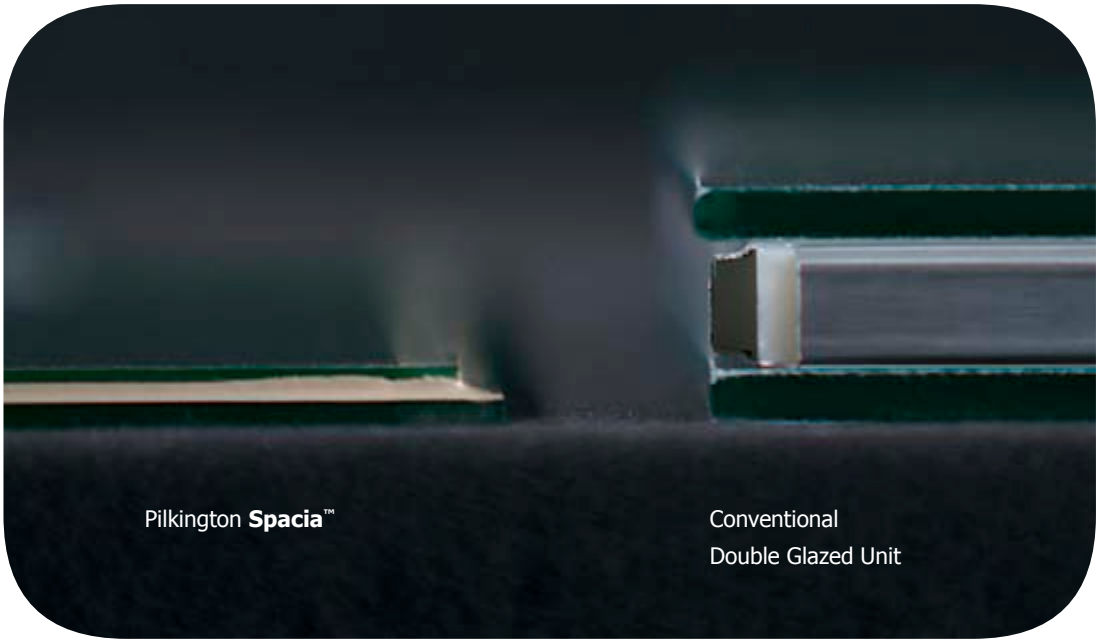
"Conduction" is the transfer of heat through an object. Since heat does not transfer in a vacuum, conduction is significantly reduced.

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.



Pilkington **Spacia**™ Product Lineup

The Pilkington **Spacia**™ products include many variations, including types designed for high thermal performance and others with enhanced sound and thermal performance.

Pilkington **Spacia**™

Standard Pilkington **Spacia**™ is the original 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.

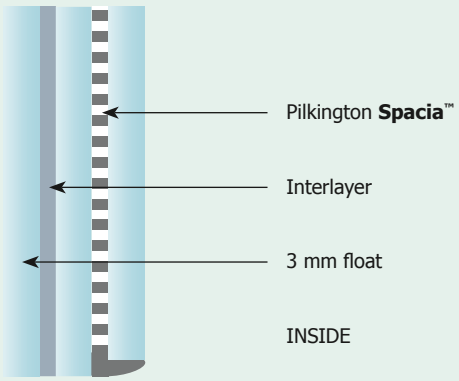
Pilkington **Super Spacia**™

Pilkington **Super Spacia**™ is slightly thicker with a total overall thickness of 10.2 mm but has the lowest U-factor of all Pilkington **Spacia**™ products. Additionally, it has a wider pillar array than standard Pilkington **Spacia**™.

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, in spite of its thin structure.

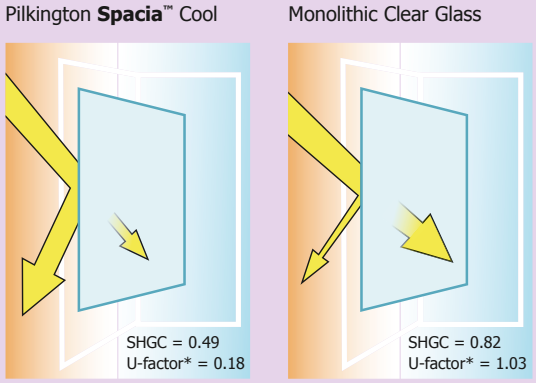
Pilkington **Spacia**™ Shizuka vacuum glazing unit construction



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.



Figures demonstrate improved solar performance over clear glass.

* Btu/hr ft² °F

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.

Pilkington **Spacia**™ Opaque

The Pilkington **Spacia**™ Opaque has the appearance of a sand blasted or acid etched glass on one lite to allow for more design opportunities while still achieving ideal thermal performance and thicknesses. The maximum size is 1800 mm × 1200 mm.

Performance Data

Product	Thickness Available (mm)	Interior lite (mm)	Gap	Exterior lite (mm)
Pilkington **Spacia**™	6.2 8.2 10.2	3 mm Clear 3 mm Clear 5 mm Clear	0.2 mm vacuum	3 mm Clear Pilkington **Energy Advantage**™ 5 mm Clear Pilkington **Energy Advantage**™ 5 mm Clear Pilkington **Energy Advantage**™
Pilkington **Spacia**™ Cool	6.2 8.2 10.2	3 mm Clear 3 mm Clear 5 mm Clear	0.2 mm vacuum	3 mm double silver 5 mm double silver 5 mm double silver
Pilkington **Spacia**™ Shizuka	9.2 9.7 10.7 11.7	Laminates a lite to the exterior face of any of the above versions		
Pilkington **Super Spacia**™	10.2	5 mm Clear	0.2 mm vacuum	5 mm double silver

Product	Thickness (mm)	U-Factor (Wm^2/K) / ($Btu/hr\,ft^2\,°F$)	SHGC	Maximum Size	Minimum Size
Pilkington **Spacia**™	6.2	1.4 (0.25)	0.66	2400 x 1500 (94 1/2 × 59 1/16)	335 × 120 (13 3/16 × 4 3/4)
Pilkington **Spacia**™	10.2	1.4 (0.25)	0.66	3000 x 2000 (118 1/8 × 78 3/4)	335 × 120 (13 3/16 × 4 3/4)
Pilkington **Spacia**™ Cool	6.2	1.0 (0.18)	0.49	2400 x 1500 (94 1/2 × 59 1/16)	335 × 120 (13 3/16 × 4 3/4)
Pilkington **Super Spacia**™	10.2	0.65 (0.11)	0.49	2400 x 1500 (94 1/2 × 59 1/16)	335 × 120 (13 3/16 × 4 3/4)

Product	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 (Wm^2/K)	U.S. Winter ($Btu/hr\,ft^2\,°F$)	
Pilkington **Spacia**™	6.2	76	16	61	15	1.4	0.25	0.66
Pilkington **Spacia**™ Cool	6.2	70	23	46	36	1.0	0.18	0.49
Pilkington **Spacia**™ Shizuka	9.2	73	15	56	13	1.4	0.25	0.61
Pilkington **Spacia**™ Cool Shizuka	9.2	68	22	42	29	1.0	0.18	0.46
Pilkington **Super Spacia**™	10.2	68	16	—	—	0.65	0.12	0.49

U.S. U-Factor ($Btu/hr\,ft^2\,°F$) 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 [2 - 7].
All products are available in thicker forms if additional glass strength is required.

Features and Benefits

- Thermal performance of modern double glazing in the same thickness as a single pane of glass
- Minimum disruption to existing older window frames and sashes as it can be retro-fitted into the existing frames
- Cost effective method of improving the energy of older homes and buildings
- Improved acoustic performance over single glazing or standard IGU, enhancing the living and working environment
- Custom sizes available
- Proven technology; successfully used in Japan and other countries for over 20 years
- Pilkington provides a ten year warranty to the installer

Noise Control

In addition to thermal efficiency, the Pilkington **Spacia**™ products provide sound insulation to block out noises generated inside and outside a room, enhancing acoustic performance and creating the ultimate quiet environment.

While 6 mm monolithic glazing provides an STC of 31, Pilkington **Spacia**™ provides improved acoustic performance within the same profile thickness. Pilkington **Spacia**™ provides acoustic performance comparable to that of modern double glazed unit comprised of two 6mm plies of glass separated by a 12 mm air space with an STC of 34.

Pilkington **Spacia**™

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

Frequency range: 100 - 5000 Hz

Pilkington **Spacia**™ Shizuka

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

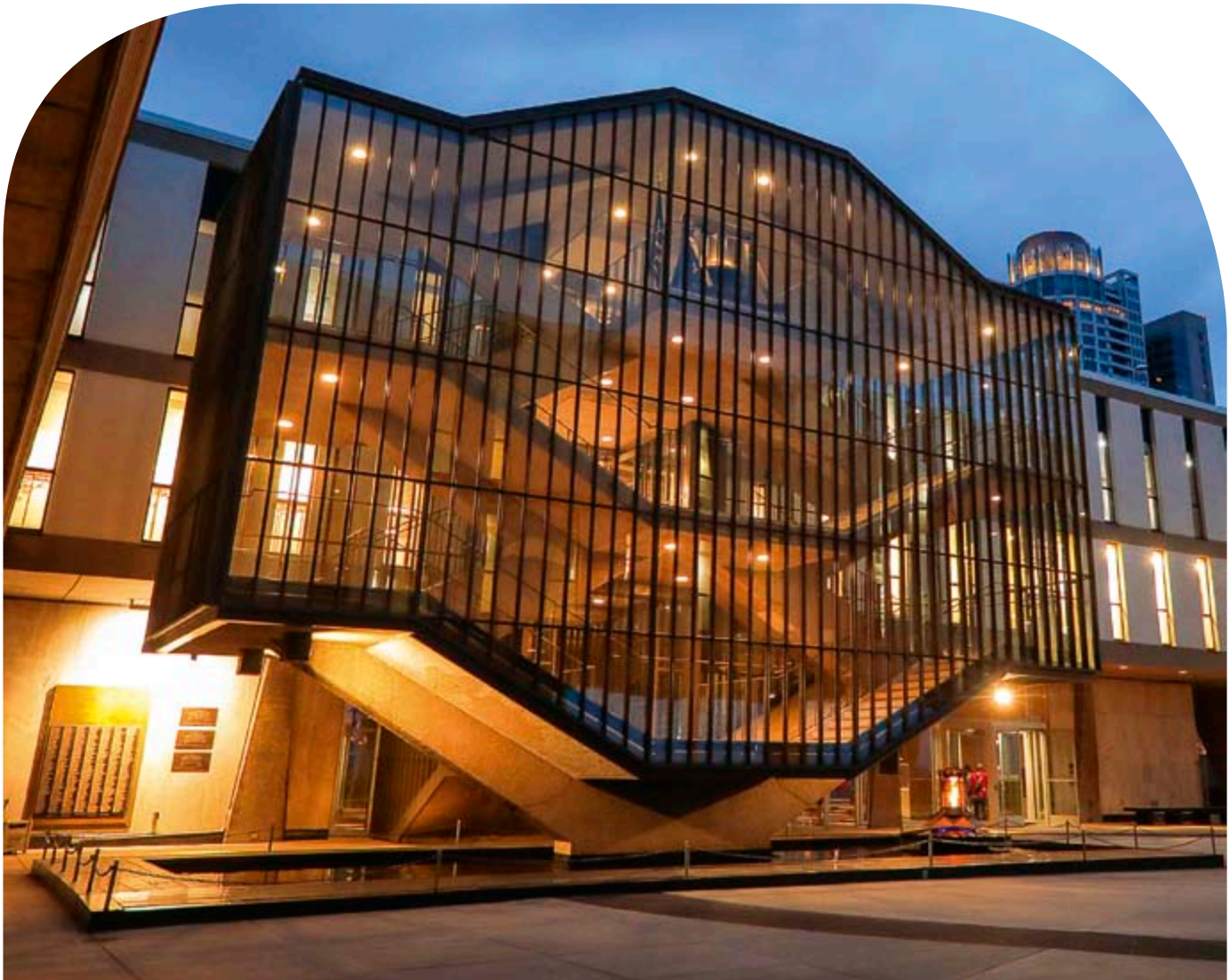
Frequency range: 100 - 5000 Hz

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.

- Ideal for use in historic buildings
- Sliding windows
- Secondary glazing
- As part of a triple glazed window



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