

glass *in building*

Edition No.12
Pilkington products for sustainable architecture
The International Magazine for Glass and Design


PILKINGTON
NSG Group Flat Glass Business

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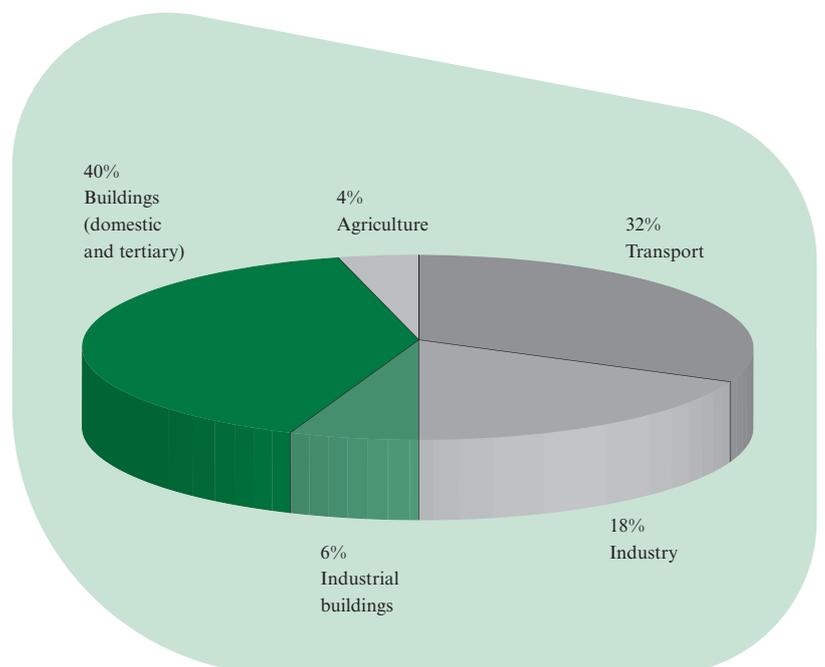
Introduction

The debate about Climate Change is over. All governments around the world and the overwhelming majority of scientists, agree that human activity – particularly increasing energy consumption – is accelerating Climate Change. Unless halted or reversed, the changes in the global climate will have negative environmental, economic and societal consequences within the lifetime of our children.

There may be disagreement at the margins, about the speed of this change and about the detail of the consequences, but the political and scientific consensus is that humankind's increasing dependence on and consumption of fossil fuels must be reversed.

That is why in recent years we have seen international agreements on reducing carbon emissions and why so many governments now have ambitious targets for saving energy. The world's citizens wait to see if these agreements and targets develop into detailed policies and firm legislation.

Building design will play a key role in achieving these objectives. That is because, in advanced countries, the energy used in buildings represents 40 to 50 per cent of energy consumption, as the chart below shows.



Breakdown of EU energy demand in 2005, by sector

Source: Action Plan for Energy Efficiency: Realising the Potential. European Commission, October 2006





Whilst society looks to develop carbon-free energy sources, the clock is ticking. Renewable energy will have a vital role to play in the future, but the immediate priority has to be to reduce fossil fuel consumption by using it more efficiently. Buildings will increasingly become the focus because, not only are they a significant energy consuming sector, but the technologies and products to make buildings substantially more energy-efficient have already been developed. They are available now and just need to be applied!

Improving the energy-efficiency of buildings brings other benefits too. Buildings are more comfortable and cheaper to run for the owner and occupier. And from a societal point of view, national economies and energy security will improve when energy-importing countries become less dependent on increasingly expensive supplies from other parts of the world.

So, making buildings more energy-efficient is a win-win situation! And glass has a vital role to play. No other building material has a more powerful influence on the energy performance of a building than glass.

Response to Climate Change

In the global discussions about Climate Change and energy-efficiency, architecture has moved to centre-stage. Governments around the world are becoming aware that buildings offer the biggest energy-saving potential and that the technology to achieve this already exists.

In Europe for example, the EU's Action Plan for Energy Efficiency¹ gives a target of reducing Europe's CO₂ emissions by 20 per cent by 2020. The Action Plan contains a raft of specific strategies and measures across the economy, but significantly states "the largest cost-effective savings potential lies in the residential and commercial buildings sector, where the full potential is now estimated to be around 27 per cent and 30 per cent of energy use respectively".

Governments are beginning to understand that improving the energy-efficiency of the existing building stock and moving the standards for new buildings towards zero-carbon, offers the best opportunity to achieve reductions in CO₂. And we are starting to see the implementation of specific legislation to help achieve this. In the EU, each of its 27 Member States has produced a National Energy Efficiency Action Plan, outlining the current and future measures for improving their energy-efficiency and the building sector invariably occupies a prominent place.

One of the most influential pieces of recent legislation by the EU has been the Energy Performance of Buildings Directive². This requires the EU countries to introduce laws in a number of key areas.

Building regulations drive design in new buildings. One of the Directive's requirements is that national building regulations for energy-efficiency, based on a building's total energy consumption (rather than on the performance

of specific components), must be introduced – and furthermore these regulations will have to be reviewed and improved at no more than five-yearly intervals from now on. Architects will therefore need to become accustomed to a constantly changing set of building regulations in the years ahead.

The biggest challenge, however, lies with the existing building stock. The Directive therefore requires that every building larger than 1,000 m², when undergoing major refurbishment, will have to be upgraded with the best practicable energy-saving technologies – even if improving energy-efficiency was not the purpose of the refurbishment. So, for example, it could be mandatory to replace old and inefficient glazing with the latest low-e or solar control glass. The European Commission is proposing that the Directive be revised by 2009 so that this requirement would apply to all buildings, including housing, in future.

Perhaps the most innovative aspect of the Energy Performance of Buildings Directive is the requirement for buildings to have energy certificates. It is becoming mandatory in each EU country that every private sector building, when constructed, sold or rented, should have an energy certificate. It will also be a requirement for every public building over 1,000 m² to have an energy certificate, prominently displayed.

These certificates will indicate a building's energy performance, not only in numerical terms, but in a visual way – such as a simple A to G or colour-coded scale – which will resonate with the public. In addition, each certificate will be accompanied by a report, indicating the measures required to improve the rating, allowing member states to introduce fiscal incentives that support the upgrade of buildings' energy performance.

¹ Action Plan for Energy Efficiency: Realising the Potential. European Commission, October 2006.

² Directive 2002/91/EC on the Energy Performance of Buildings. European Parliament and Council, December 2002.



Another example of the energy-rating and certification of buildings is the LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ in the USA. This has been developed by the US Green Building Council to assess, acknowledge and certify the environmental impact of new and existing buildings. As well as energy, LEED credits and rewards buildings with high natural lighting levels and good vistas – all aspects which are uniquely achieved by glass.

Energy and environmental rating schemes, such as these in Europe and North America, are undoubtedly making energy-efficiency more quantifiable and tangible. They are systems that building owners and developers can understand, and they will certainly result in better performing buildings, becoming more valuable and marketable compared with their inefficient counterparts.

Next example is the increase in the demand for “Passive Houses”. Originating from the Passiv Haus Institut in Germany, but also adopted in Austria, “Passiv Haus” is a standard for low-energy houses that allows conventional space heating to be omitted. In the European Passive House Standard, PEP (Promotion of European Passive Houses, a consortium of European partners, supported by the European Commission), has proposed some recommendations for the performance of the building and some of its components including glazing recommendations.

The political momentum is clearly heading in the direction of more legislation, and other initiatives, to reduce the energy impact of buildings. And the market is pulling in the same direction, with building developers, owners and occupants increasingly demanding more energy-efficient buildings.

Pilkington has responded by continually innovating and developing products to help architects achieve this. Our low-e glass reduces heat loss but allows high levels of valuable free solar gain to heat buildings with no significant loss in natural light. In buildings that would have traditionally been air-conditioned our solar control glass rejects unwanted solar radiation but transmits valuable daylight, reducing the capital outlay, running costs and associated carbon emissions.

The topic of air-conditioning is now becoming a major concern to policy-makers, who realise its growth presents serious challenges to achieving our targets. Glass for Europe – the organisation representing Europe’s flat glass manufacturers – has recently conducted a study³ to quantify the CO₂ savings that would be achieved if solar control glass was used in Europe’s air-conditioned buildings. It shows that the use of solar control glass in all new and existing air-conditioned buildings could meet up to 25 per cent of the EU’s CO₂ reduction target for the building sector by 2020.

The good news for legislators and architects is that the products to achieve low-energy buildings are not waiting to be developed – they are available now. Modern products from Pilkington enable buildings to be both energy-efficient and beautiful. Glass can be used as a positive contributor to low-energy performance, whilst creating interiors that are vibrant and façades which connect the occupant with the outside world.

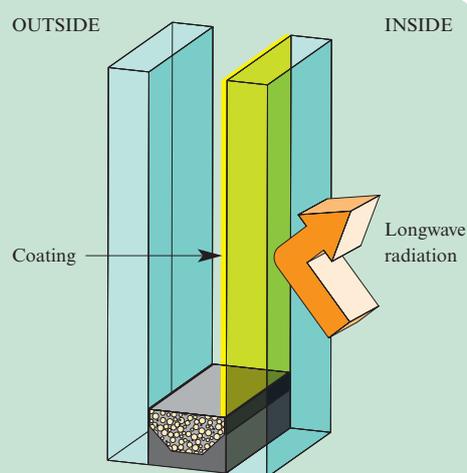
The following pages give an overview of Pilkington’s Energy Efficient products as well as some examples of their applications. Please enjoy them and see how these products are used to meet the aspirations of clients and the demands of society and legislators across the world.

³ Solar control glass for Greater Energy Efficiency. Glass for Europe, November 2007.

Our product range

Low-emissivity glass (energy-saving glass)

Advances in low-emissivity (low-e) glass technology have made windows an essential contributor to energy conservation and comfort, minimising internal condensation and heat loss. The energy efficiency is usually expressed in terms of U value, which is the rate of heat loss in Watts per square metre per degree Kelvin temperature difference between inside and outside (expressed in W/m^2K). Effectively, low-e glass will reflect energy back into a building, to achieve much lower heat loss than ordinary float glass.



Insulating Glass Unit incorporating low-e glass

Additionally, different types of low-e glass give different amounts of passive solar heat gain which helps reduce heating requirements and costs, especially in colder months.

There are two basic types of low-emissivity coating for glass known as on-line coatings (such as Pilkington **K Glass**[™] in Europe or Pilkington **Energy Advantage**[™] in the USA) and off-line coatings (such as Pilkington **Optitherm**[™], whether it is Pilkington **Optitherm**[™] SN

or Pilkington **Optitherm**[™] S3). On-line coatings are applied during the glass manufacture, whereas off-line coatings are applied afterwards.

Off-line coatings are generally able to give higher levels of thermal insulation and light transmittance than on-line coatings but they require extra care in handling and processing. Off-line coatings can be supplied in toughened and laminated form by applying the coating to pre-processed glass, they can also be offered in some toughenable forms.

The Pilkington **Optitherm**[™] range offers excellent visible light transmittance to reduce energy consumption and provides a comfortable and naturally-lit environment.

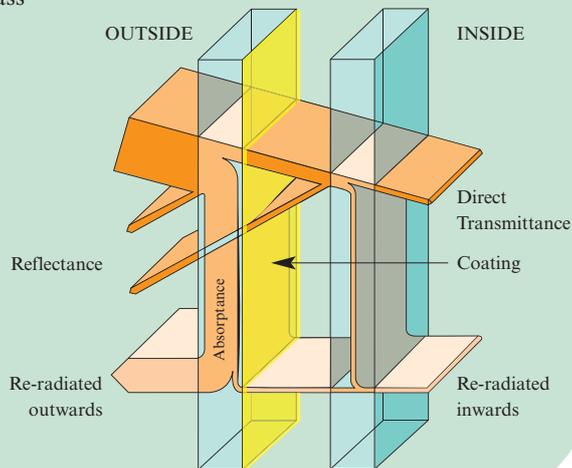
Generally, on-line coated glass offers lower thermal insulation levels than off-line coated products. However, they are easier to handle and process and can be toughened or laminated without difficulty. In addition, on-line coated products, such as Pilkington **K Glass**[™] and Pilkington **Energy Advantage**[™] are far more durable and achieve a higher degree of passive solar gain.

Solar control glass

Glass controls solar radiation by reflectance, transmittance and absorptance. For solar control purposes these are defined as:

- Reflectance – the proportion reflected back into the atmosphere
- Absorptance – the proportion absorbed by the glass
- Direct Transmittance – the proportion transmitted directly through the glass
- Total Transmittance (also referred to as g value or solar factor) – the total amount of the sun's energy transmitted through the glass. It comprises the direct transmittance and the absorbed energy that is re-radiated into the building.

Insulating Glass Unit
incorporating coated
solar control glass



In hot climates, solar control glass can be used to minimise solar heat gain and help control glare, whilst in temperate regions it can be used to balance solar control with high levels of natural light.

Solar control glass can be specified for any situation where excessive solar heat gain is likely to be an issue, from conservatories to glass walkways and building façades to atria. The Pilkington solar control glass range offers performance options to suit almost every need, with each product available in toughened or laminated form.

Solar control can be achieved in a number of ways, including body-tinted glass, coated glass, laminated glass with tinted interlayers, screen printed glass and Insulating Glass Units incorporating blinds.

Pilkington **Optifloat™** Tinted is a range of low-performance, body-tinted glass which is manufactured using the standard float glass process. Solar control properties and colour densities vary with thickness. The tints available are Bronze, Grey, Green, Blue-Green, Pilkington **SuperGrey™**, Pilkington **EverGreen™** and Pilkington **Arctic Blue™**.

Pilkington **SunShade™** is a low g value, toughenable off-line coated solar control product. It is highly durable and is best suited to very hot climates where reduced solar glare, as well as a low light transmittance and low shading coefficients, are especially important.

Pilkington **Suncool™** is a range of off-line coated, energy management glass combining high visible light transmittance with solar control and low-emissivity performance all in one product. It is always used as part of an Insulating Glass Unit where its coating also provides a high level of thermal insulation.

Depending on the individual situation, a wide range of colours and performance options are available, including: Pilkington **Suncool™** High Performance in Neutral and Silver, Pilkington **Suncool™** Brilliant and Pilkington **Suncool™** Brilliant Blue.

Many of the Pilkington **Suncool™** products are available in conjunction with the Pilkington self-cleaning coating on surface 1, such as Pilkington **Activ Suncool™**.

Pilkington **Activ™** Blue and Pilkington **Activ™** Neutral are other self-cleaning glasses that have solar control performance.

Pilkington **Eclipse Advantage™** and Pilkington **Solar-E™** are on-line environmental control glasses that combine medium performance solar control with low-emissivity in a variety of attractive colours; these products are highly durable, easy to process and are toughenable.

Summary of Pilkington low-emissivity and solar control products

	low-e	low-e & self-cleaning
Off-line coated	Pilkington Optitherm™ S3	Pilkington Activ Optitherm™ S3
	Pilkington Optitherm™ SN	Pilkington Activ Optitherm™ SN
	Pilkington Optitherm™ SN Pro T	
On-line coated	Pilkington K Glass™	
	Pilkington Energy Advantage™	

	solar control	solar control & self-cleaning
Off-line coated	Pilkington SunShade™	Pilkington Activ™ Neutral
Tinted Glass	Pilkington Optifloat™ Tints	
	Pilkington Arctic Blue™	Pilkington Activ™ Blue
	Pilkington EverGreen™	
	Pilkington SuperGrey™	

	low-e & solar control	low-e, solar control & self-cleaning
Off-line coated	Pilkington Suncool™ Brilliant 66/33	
	Pilkington Suncool™ Brilliant 50/25N	
	Pilkington Suncool™ Brilliant Blue 50/27N	Pilkington Activ Suncool™ Brilliant Blue 50/27N
	Pilkington Suncool™ Brilliant 40/22	Pilkington Activ Suncool™ Brilliant 40/22
	Pilkington Suncool™ Brilliant 30/17	Pilkington Activ Suncool™ Brilliant 30/17
	Pilkington Suncool™ HP Neutral 70/40	Pilkington Activ Suncool™ HP Neutral 70/40
	Pilkington Suncool™ HP Neutral 53/40	Pilkington Activ Suncool™ HP Neutral 53/40
	Pilkington Suncool™ HP Silver 50/30	Pilkington Activ Suncool™ HP Silver 50/30
On-line coated	Pilkington Eclipse Advantage™ Clear	
	Pilkington Eclipse Advantage™ Bronze	
	Pilkington Eclipse Advantage™ Grey	
	Pilkington Eclipse Advantage™ Arctic Blue	
	Pilkington Eclipse Advantage™ Blue-Green	
	Pilkington Eclipse Advantage™ EverGreen	
	Pilkington Solar-E™	

Many of these products are available in laminated form.

All the above products can be combined with an additional low-e glass in an Insulated Glass Unit to enable buildings to be highly energy-efficient.

Double and Triple-glazing

The performance of the majority of Pilkington products assumes their incorporation into Insulating Glass Units (IGUs). Essentially, IGUs are pieces of glass separated by a gas-filled chamber and sealed around the edges. IGUs can incorporate two

or three panes of glass to give double or triple-glazing. Use of additional panes of glass (i.e. triple-glazing) enhances particularly the thermal insulation properties of the IGU. Additionally, the choice of edge seal material between the two panes of glass and the choice of gas used to fill the created cavity can enhance the overall thermal performance of the IGU and thus the window. Examples of Pilkington IGU product brands are Pilkington **Insulight™** and Pilkington **energiKare™**.

03

chapter

Case studies

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Spa Hotel, Loipersdorf, Austria

The newly-restored Wellness facilities at the Spa Hotel Stoiser in Loipersdorf, provided architects with the challenge of glazing the building's long façades in an energy-saving way while still providing a comfortable and practical user environment and a sympathetic ambience.

High performance solar control, a modern design and optimised thermal insulation were the most important criteria in the architects' choice of materials.

Pilkington **Eclipse Advantage™** EverGreen provided the solution in the following ways:

- The glass' green colour provides a combination of functionality and design while promoting the required 'Wellness' atmosphere from the outside and calm ambience inside.
- The area of glass needed for the long façades (500 m²) meant particular attention had to be paid to insulation, solar control and light transmission to ensure energy savings in



heating, cooling and lighting the inside of the building.

Pilkington **Eclipse Advantage™** EverGreen was the perfect solution; it combines low-emissivity with solar control.

Pilkington **Eclipse Advantage™** EverGreen has a unique combination of high light transmittance, with reduced solar gain and glare; it has a very low solar factor (g value) of 25 per cent. In comparison with normal glass, the combination of solar control and thermal insulation considerably reduces the need for heating and cooling within the building which allows savings on energy consumption.



Project Summary

Building name

Spa Hotel Loipersdorf

Location

Loipersdorf, Austria

Architect

Strohecker

Window manufacturer

Spiel Dach & Glas GesmbH in

Fehring

Glass surface

500 m²

Glass products

Pilkington **Eclipse Advantage™**

EverGreen



Project Summary

Building name

Piscine de Mourenx

Location

Mourenx, France

Client

Commune de Mourenx

Architect

Gilles Bouchez – Paris

Technical office

BEFS – Toulouse

Façade builder

Ets Arcouet – Anglet

Glass surface

2400 m²

Glass products

- Pilkington **Insulight™** Sun made of Pilkington **Suncool™** HP Neutral 70/40 6 mm / Air 16 mm / Pilkington **Optilam™** 10.8
- Pilkington **Insulight™** Sun made of Pilkington **Optilam Suncool™** HP Neutral 70/40 10.8 / Air 16 mm / Pilkington **Optilam™** 10.8

Swimming pool, Mourenx, France

As well as becoming the most modern in France, a new 25 m-long swimming pool in the Aquitaine region's Mourenx sport centre was destined to be the first in its area to follow the High Environmental Quality (HQE) standard. This label, now commonly used in France, denotes an 'environmentally-friendly' process or product which reduces a building's negative environmental impact while guaranteeing best running costs and offering maximum user comfort.

The pool forms part of an impressive, 450-person capacity water centre offering a solarium, massage benches, sauna and therapy areas. It was essential therefore, to utilise the latest technology to provide the best environment and ensure user comfort.

The centre also had to fulfil six objectives: to meet standards in energy and acoustic management, visual appeal, health

considerations, water treatment and hydrothermal monitoring.

User comfort has been ensured through:

- computer monitoring of swimmers' chlorine absorption,
- permanently treated and dehumidified air,
- minimal noise disruption – thanks to specific ceiling and wall construction,
- comfortable solar-powered internal temperatures,
- pleasant ambiance through natural light.

The building's consumption of energy and its running costs have been reduced by:

- Solar roof panels minimising running costs – providing 30 to 40 per cent of the needs in sanitary hot water, while a thermodynamic system reuses heat.



- Constructing the façade with 2,400 m² of Pilkington **Insulight™** Sun consisting of Pilkington **Suncool™** HP Neutral 70/40 and Pilkington **Optilam™**. This glass construction maximises natural light into the pool, foyer, corridors and changing areas and minimises the solar heat gained through the glass. Consequently, the requirements for interior lighting and the need for heating/cooling the building are reduced – providing substantial energy and costs savings in the process. Swimming pools can present a challenge to control internal condensation that can lead to discoloration of internal decor or concentrations of chemical residues. By installing Pilkington **Suncool™** HP Neutral 70/40 the internal pane temperature remains relatively high due to the thermal properties of the



glass and the risk of condensation forming is reduced.

- The aluminium façade, which ensures direct access from the swimming pool to the terraced deck chair area through the use of electric sliding doors (12 m x 6 m and 6 m x 6 m), provides the highest levels of insulation through the use of a thermally broken frame, reducing further the need for heating or cooling the inside of the building.





Project Summary

Building name

Office Building

Location

Larvik, Norway

Architect

Cosmic Bygg AS

Façade builder

APS AS

IGU producer

Glassfabrikken

Glass surface

460 m²

Glass products

North façade:

- Pilkington **Insulight™** Therm Triple made of Pilkington **Optitherm™** SN 6 mm / Argon 12 mm / Pilkington **Optifloat™** Clear 4 mm / Argon 12 mm / Pilkington **Optitherm™** SN 4 mm

South, west and east façades:

- Pilkington **Insulight™** Sun Triple made of Pilkington **Suncool™** Brilliant 66/33 6 mm / Argon 12 mm / Pilkington **Optifloat™** Clear 4 mm / Argon 12 mm / Pilkington **Optitherm™** SN 4 mm

Aluminium-clad façades:

- Pilkington **Insulight™** Sun Triple made of Pilkington **Suncool™** Brilliant 66/33 6 mm / Argon 12 mm / Pilkington **Optifloat™** Clear 4 mm / Argon 12 mm / Pilkington **Optitherm™** SN 6 mm

Office building, Larvik, Norway

In the process of designing a red brick, riverside office building in Larvik, Norway, the architects needed to ensure consistent optimum energy balance for its users while at the same time creating an environmentally-friendly structure.

The 2,400 square-metre building combined 240 square metres of traditional windows with 220 square metres of large glass façades – facing all points of the compass. Part of the challenge, therefore, was to make best use of the building's positioning.

But, given the volume of glass that needed to be incorporated, the biggest challenge facing the architects was to ensure the minimisation of CO₂ emissions and the maximisation of energy-efficiency.

The required outcome was achieved in the following ways:

- For the least-sunny north façade, choosing a three-pane IGU combination – two panes of Pilkington **Optitherm™** SN and one pane of Pilkington **Optifloat™** Clear – provided the best thermal solution.
- Solar control glass in the south, west and east-facing windows keeps the heat from the sunlight under control. By choosing Pilkington **Suncool™** Brilliant 66/33 as the outer pane in the IGU, it was possible to achieve a comfortable indoor climate for the users.



- The large glass aluminium-clad façades have the same combination, with Pilkington **Suncool™** Brilliant 66/33, Pilkington **Optifloat™** Clear and Pilkington **Optitherm™** SN, but using a thicker pane of Pilkington **Optitherm™** SN. This combination has reduced the use of air-conditioning and need for heating, providing a positive impact on the overall environment. Less energy is used, CO₂ emissions are reduced and runnings costs are lower.

By choosing glass from the Pilkington range of neutral appearance products, a high solar and thermal performance can be achieved without sacrificing the natural appearance of glass in the façades.





Project Summary

Building name

Lotos Group SA's headquarter

Location

Gdańsk, Poland

Client

Lotos Group SA

Architect

Arch-Deco Sp. z o.o.,
Zbigniew Reszka, Michał
Baryżewski, Barbara Jawień

General contractor

Konsorcjum Alkon S.A.,
Elektrobudowa

Façade builder

ELJAKO-AL Sp. z o.o.

IGU producer

Pilkington IGP

Glass surface

4,760 m² for all façades
and balustrades

Glass products

Pilkington **Optiwhite**[™]

Pilkington **Suncool**[™] HP

Neutral 70/40

Pilkington **Optilam**[™] 8.8

Pilkington **Optilam**[™] 9.5

Lotos Group SA's headquarters, Gdańsk, Poland

The new eight-floor Lotos Group SA's headquarters in Gdańsk, is smart, energy-saving, elegant and an area landmark – thanks to the use of Pilkington products within a stunning architectural design.

The challenge for the building – situated on an old oil refinery site – was to construct an office in keeping with modernisation plans for other buildings in the area. Top priority was to be given to design, energy conservation, public safety, air conditioning, ambiance, creativity and innovation. The Lotos Group wanted its office to be practical and environmentally-friendly as well as becoming a stunning local landmark.

Award-winning architects Arch-Deco designed an elegant yet innovative building, following the trisection principles of classical architecture. Particularly interesting was the idea of the square with glass corridors of elliptic shape, that lead to the other buildings of the complex.

The building is a triangle with convex sides and rounded apexes oriented along the east-west axis, to provide each floor with natural daylight to create the right ambiance and reduce the need for lighting. The building design's criteria were also met by creating a façade using double-skin technology:

- The external skin comprises Pilkington **Optiwhite**[™] toughened safety glass. Different from ordinary float glass, Pilkington **Optiwhite**[™] allows greater transparency, creating the required internal and external ambiance but more importantly providing maximum light transmission, which reduces the need for artificial lighting and therefore ensures energy savings.
- The façade's internal skin comprises Pilkington **Suncool**[™] HP Neutral 70/40 solar control glass combined with Pilkington **Optilam**[™] 8.8 laminated safety glass. Pilkington **Suncool**[™] HP Neutral 70/40 ensures high light transmission with high solar control and very good thermal insulation, reducing the need for heating, cooling and lighting the inside of the building.
- For the more vulnerable ground floor, the innovative Pilkington **Optilam**[™] 9.5 anti-burglary safety glass has been used.
- External and internal skins of the façade are separated with a 600 mm wide ventilated air space which, as well as having thermal properties, works as a filter. It transmits only clean air to the inside of the building and all pollution from the outside is blocked.

The double-skin technology in conjunction with the air-conditioning system result in improved energy balance and minimized impact on the environment and its occupants.





19 mm of toughened Pilkington **Optiwhite™** has been used for the glass balustrades of the top level external terrace, where personal safety is needed. It provides protection for visitors whilst making the most out of the panoramic views.

The final creative touch was the addition of floodlights pulsating with various colours on blinds that are lowered between the façade's internal and external skins. Electronic controls allow changes in the colours of the façade and the generation of moving display text advertising the company's services.



Project Summary

Building name

Business/shopping centre

Location

Pordenone, Italy

Client

Uberco Srl – Puja Prata di Pordenone (PN)

Architect

Studio AST degli Architetti Rui Pillon e Vinante – Sacile (PN)

Façade builder

Pavarin F.lli Snc – Rivarotta Pasiano di Pordenone (PN)

IGU producer

SAV 2000 – San Donà di Piave (VE)

Glass surface

480 m²

Glass products

Pilkington **Optitherm**™ S3

Pilkington **Optilam**™

Pilkington **Optilam**™ Therm S3

Business/shopping centre, Pordenone, Italy

The architects of a new business/shopping centre on the outskirts of Pordenone, Italy were tasked with making the modern and elegant four-storey building energy-saving, ahead of legislation. As from 1 January 2008, for this particular climatic zone, new buildings will have to comply with a maximum thermal transmittance value (U) of 2.4 W/m²K for the overall window or 1.9 W/m²K for the glass only centre pane U value.

The client decided to implement an energy-saving policy ahead of schedule in the hope of increasing the building's value and reducing overheads.

Also, as the centre accommodates architects, law firms, paramedical services and shops on the ground floor, the architecture had to combine safety features with originality and

innovation along with the urban traditional.

With such a variety of users in the building, it is not uncommon for glass to be required to achieve several objectives at the same time to ensure the building meets the needs of all the occupants. Due to its wide product range Pilkington is able to combine glass specifications to satisfy the design criteria.

How objectives were achieved:

- Low-emissivity double-glazing containing Pilkington **Optitherm**™ S3 in metal frames with a thermal break was installed to take the building beyond future performance requisites. Pilkington **Optitherm**™ S3 delivers a thermal transmittance of 1.4 W/m²K (value at centre) without using gas. This new generation, low-emissivity double-glazing,



cuts losses of traditional double-glazing by half. As a consequence, the need for heating the building is reduced, creating an annual saving of around 40 kWh per square metre.

- Large feature aluminium-clad windows blend in with the surroundings, providing the low reflection needed to avoid impacting on the environment, while at the same time ensuring maximum natural light transmission.
- By using laminated safety products such as Pilkington **Optilam**[™] and Pilkington **Optilam**[™] Therm S3 (laminated low-e glass), the windows fulfilled the acoustic, the insulation and safety characteristics needed within a public building.





Project Summary

Building name

Manor house

Location

Schwyz, Switzerland

Architect

Lucas Steiner, Sabine Wille,
Benedict Steiner, Schwyz

Window manufacturer

M. Langenegger, Gersau

IGU producer

Pilkington Glas Wikon AG,
Wikon

Glass surface

150 m²

Glass products

Pilkington **Insulight™** Protect,
consisting of
Pilkington **Optifloat™** and
Pilkington **Optilam™** Therm S3
with WarmEdge spacers

MINERGIE® is a widely-accepted registered quality label for new and refurbished low-energy consumption buildings in Switzerland. At its heart lies user comfort through high-grade building envelopes and continuous air renewal. In meeting the standard, architects and engineers have complete freedom in their design and choice of materials and in their choice of internal and external building structures.

A 15th century manor house, Schwyz, Switzerland

The grounds of a protected 15th century manor house in Schwyz, Switzerland, provided the architects with the challenge of constructing two new homes where a number of developments over the years had already provided a range of building styles – from the Renaissance to the 21st century.

The difficulty lay in incorporating a sizeable new property into this established and relatively constricted area with protected building status, to provide two family homes of equally high quality for light, air and space in accordance with the latest **MINERGIE®** standard.

Creating two individual apartments within a three-storey building – one on the ground-floor and one in the loft – meant both apartments being able to benefit from maximum sunlight,

high-quality living environment and environmentally-friendly products and standards:

- Clad in dark, natural slate tiles, the structure blends perfectly into its historic context and, with its plywood panels and larch windows the building looks both simple and elegant and fits perfectly into the landscape.
- The architectural design is complemented by a state-of-the-art concept for the domestic engineering services and the use of innovative construction techniques.
- In line with the **MINERGIE®** standard, the building was constructed with 18 cm thick insulation, pellet heating, controlled ventilation and larch windows, ideal for heat insulation.
- Pilkington **Insulight™** Protect, consisting of Pilkington **Optifloat™** and



Pilkington **Optilam™** Therm S3 with WarmEdge spacers, has a centre-pane Ug value of 1.0 W/m²K. Insulated spacers rather than aluminium further improve the insulation performance. The use of highly efficient Pilkington glass with the insulation properties of timber framed windows and a low-conductivity spacer bar between the glass panes means the window as a whole can achieve high levels of thermal insulation, required for reduced energy use and comfort.

The combination of the **MINERGIE®** standard and the type of glass used produces a bright interior environment and perfect insulation, reducing the need for energy (lighting/heating) in this location, where weather conditions can be very harsh in winter.





Project Summary

Building name

ELE Headquarter

Location

Gelsenkirchen, Germany

Architect

KB Projekte GmbH,
Gelsenkirchen

Façade builder

SCHÜCO International KG,
Bielefeld Metallbau Lamprecht,
Datteln

IGU producer

Flachglas MarkenKreis GmbH,
Gelsenkirchen

Glass surface

3,800 m²

Glass products

- Pilkington **Insulight Activ**[™] made of Pilkington **Activ Optiphon**[™] and Pilkington **Optitherm**[™] S3
- Pilkington **Insulight Activ**[™] made of Pilkington **Activ**[™] Clear and Pilkington **Optitherm**[™] S3

ELE Headquarters, Gelsenkirchen, Germany

As regional energy suppliers, it was vital for Emscher Lippe Energie GmbH (ELE) that in renovating their 40-year-old dilapidated headquarters, the building's environmental impact and energy efficiency should be top priorities.

At the same time, architects were tasked with creating an optical and technical highlight within the Ruhrgebiet area of Gelsenkirchen – 'simple elegance' was to be part of the blueprint.

Other requirements included soundproofing, as the building's north side lies adjacent to a main street, a design to blend in with the busy environment and self-cleaning properties to accommodate the building's once-a-year cleaning programme.

After a year of construction, the city has a new, modern 'eye-catcher', complete with 297 Pilkington **Insulight Activ**[™] self-cleaning glass units, produced to the highest technical level providing low-energy and acoustic insulating properties.

The advantages of this design and materials used:

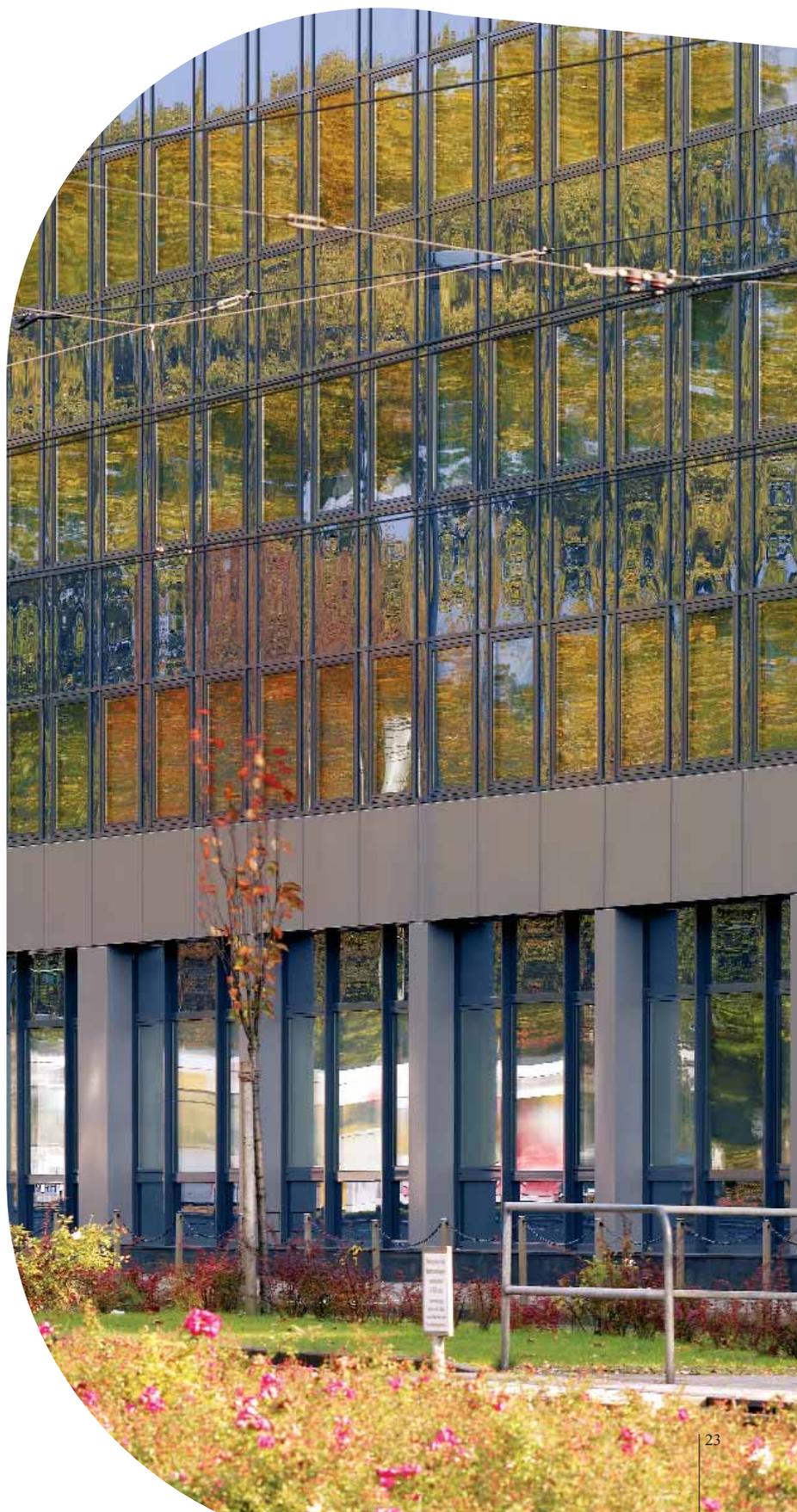
- The large modern 3,800 square-metre glass façade allows the interior to flood with daylight, reducing the need for artificial light and therefore energy and affords passers-by a clear view of the aesthetically-designed corridors.
- The use of low-e glass Pilkington **Optitherm**[™] S3 has extensively reduced the outward heat loss, while at the same time transmitting thermal heat from the sunlight – resulting in less energy demand and therefore reduced CO₂ emissions.
- As well as containing low-e glass, the north façade has been equipped with 1,000 square metres Pilkington **Activ Optiphon**[™]. Pilkington noise-control Insulating Glass Unit reduces sound by approximately 50 dB.
- All Insulated Glass Units and spandrels are equipped with Pilkington **Activ**[™] Clear self-cleaning glass.





As well as accommodating the building's cleaning programme, Pilkington **Activ**[™] is environmentally-friendly. Its self-cleaning coating contains no harmful substances; self-cleaning means reduced water waste and a reduction in the need for potentially environmentally-harmful detergents. In addition to reducing the need for water for cleaning Pilkington **Activ**[™] reduces the need to provide access for cleaning and the associated risks of high level working.

The combination of the glass used has allowed ELE to minimise the building's impact on the environment, ensuring low energy as well as low running costs.





City Library, Turku, Finland

Project Summary

Building name

City library

Location

Turku, Finland

Architect

JKMM OY

Glass surface

312 m²

Glass products

Pilkington **Planar**[™]

Pilkington **Optiwhite**[™]

Pilkington **Optitherm**[™] SN

A library situated in the south-west seaport town of Turku, Finland, needed extensive refurbishment and renovation. As well as ensuring a blend with the existing minimalist architecture, planners were asked to provide a showcase window affording library users a clear and panoramic view of the Puolala Hill – an area of natural beauty.

The size of the window – 25 m x 13 m – meant that careful consideration had to be given to ensuring minimum heat and energy loss and reduced CO₂ emissions while at the same time



providing protection against the harsh Nordic winter weather.

Architects also needed to make the optimum use of natural light and sunshine to provide students with the best possible working environment.

The glass façade, which took three months to complete, fulfilled all objectives by:

- Using triple-glazing with Pilkington **Optiwhite**[™] in the outer and middle panes and Pilkington **Optitherm**[™] SN in the inner. With its low U value achieved with a coating that prevents heat escaping, the highly transparent glass counteracts the solar losses that would normally result from having additional glass panes, maintaining a more comfortable temperature-controlled environment in which to study, while minimising the need for heating.
- Providing a complete glass envelope for building structures, without the need for conventional frames or mullions. Pilkington **Planar**[™] offered a complete, modern, frameless solution providing a flush glass surface with fins that hold the weight of the façade in place.

- Using the Pilkington **Planar**™ structural glass system combined with Pilkington **Optitherm**™ SN to maximise light transmittance and solar gain without compromising on the thermal benefits.



Category	Product	
	Solar Control	Pilkington Optifloat™ Tints
	Pilkington Arctic Blue™	
	Pilkington EverGreen™	
	Pilkington SuperGrey™	
	Pilkington Solar-E™	
	Pilkington Eclipse Advantage™ Tints	
	Pilkington Suncool™ HP	
	Pilkington Suncool™ Brilliant	
	Pilkington SunShade™	
	Pilkington Insulight™ Sun	
Pilkington Insulight™ Sun Triple		
	Thermal Insulation	Pilkington Optifloat™ Clear
	Pilkington Energy Advantage™	
	Pilkington K Glass™	
	Pilkington Optitherm™ SN	
	Pilkington Optitherm™ S3	
	Pilkington Insulight™ Therm	
Pilkington Insulight™ Therm Triple		
	Fire Protection	Pilkington Pyrostop™
	Pilkington Pyrodur™	
	Pilkington Pyrodur™ Plus	
Pilkington Pyroshield™		
	Noise Control	Pilkington Optiphon™
	Pilkington Insulight™ Phon	
	Pilkington Insulight™ Phon Triple	
	Safety	Pilkington Optilam™
	Pilkington Toughened Glass	
	Pilkington Insulight™ Protect	
	Pilkington Insulight™ Protect Triple	
	Security	Pilkington Optilam™
	Pilkington Insulight™ Protect	
	Pilkington Insulight™ Protect Triple	
	Self-cleaning	Pilkington Activ™ Clear
	Pilkington Activ™ Blue	
	Pilkington Activ™ Neutral	
	Pilkington Insulight Activ™	
Pilkington Insulight Activ™ Triple		
	Decoration	Pilkington Optimirror™ Plus
	Pilkington Optifloat™ Satin	
	Pilkington Optifloat™ Opal	
	Pilkington Oriel Collection	
	Pilkington Printed Glass	
	Pilkington Texture Glass	
	Pilkington Spandrel Glass	
	Pilkington Design Glass	
	Pilkington Insulight™ Décor	
	Pilkington Insulight™ Décor Triple	
	Glass Systems	Pilkington Planar™
	Pilkington Planar™ Triple	
	Pilkington Planarclad™	
	Pilkington Profilit™	
	Special Applications	Pilkington Galleria™
	Pilkington Optiwhite™	
	Pilkington Mirropane™	
	Pilkington SunPlus™	
Pilkington TEC Glass™		

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