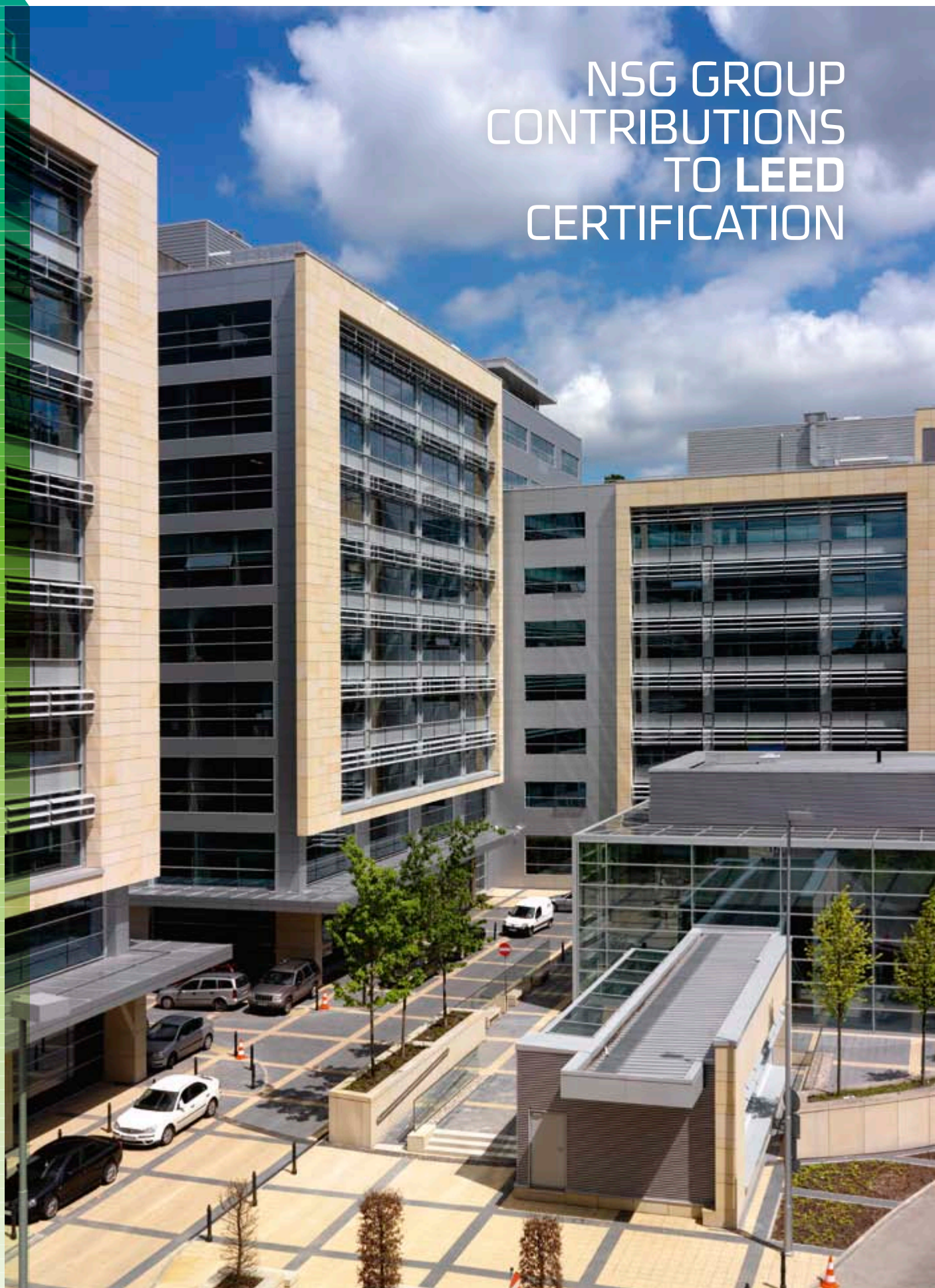


NSG GROUP CONTRIBUTIONS TO LEED CERTIFICATION



DEVELOPED BY THE US GREEN BUILDING COUNCIL, LEED (LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN) IS ONE OF THE MOST WIDELY-RECOGNISED ARCHITECTURAL STANDARDS IN GREEN OR SUSTAINABLE BUILDING DESIGN. BUILDING PRODUCTS SUCH AS GLASS CANNOT BE CERTIFIED, BUT THEY CAN PLAY AN IMPORTANT ROLE IN ACHIEVING LEED CREDITS. IN THIS GUIDE, WE DESCRIBE HOW NSG GROUP PRODUCTS CAN CONTRIBUTE TOWARDS A BUILDING ACHIEVING LEED CERTIFICATION.

For LEED certification of buildings, a total of 110 points are available, with a minimum of 40 points required for certification. Depending on the point thresholds achieved, there are four levels of certification as follows:

Certification level for building	• Points
Certified	• 40 - 49
Silver	• 50 - 59
Gold	• 60 - 79
Platinum	• 80+

This guide is based on LEED v4.1 and should be read in conjunction with LEED v4.1 Building Design and Construction. As LEED v4.1 is not a full version update of v4 and uses the existing credit requirements as a foundation, much of the information provided in this guide can also be considered for projects designed to v4.

For more details about LEED v4 and 4.1, please refer to: <https://www.usgbc.org/leed>

INTEGRATIVE PROCESS

Integrative Process

Intent: To support high-performance, cost-effective project outcomes through an early analysis of the interrelationships among systems

Credit application: 1 point

Our Value:

At NSG we strive to change our surroundings and improve our world through customer collaboration and service. Through our involvement in the concept, design and specification stages of projects and utilisation of calculation programs such as Pilkington Spectrum, we are able to help with optimised glass solutions for buildings.

ENERGY AND ATMOSPHERE

Minimum Energy Performance (prerequisite)

Intent: To reduce the environmental and economic harms of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.

Optimise Energy Performance

Intent: To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use.

Credit application: 1 - 20 points

Our Value:

Many Pilkington glass products can provide substantial energy savings and significantly influence the awarding of points for this category by reducing demand on regulated energy systems.

In cold climates, low-emissivity glass prevents heat escaping the building, while still allowing solar heat to enter it. Glass with the lowest U_g -value (the measure of heat loss expressed as W/m^2K , which is the rate of heat loss in Watts per square metre per degree Kelvin temperature difference between inside and outside) will provide the best insulation. Furthermore, in cold but sunny climates, glass achieving the highest g value, also called the passive solar heat gain (the proportion of solar radiation transmitted through the glass by all means) will help to reduce further the need for heating the inside of a building.

We have a range of low-emissivity glasses to cover all levels of requirements.

Pilkington **K Glass™** is an on-line coated glass offering medium thermal insulation performance. Although it can be used in their monolithic form, it will provide the highest thermal insulation when used in an insulating glass unit (IGU), achieving a U_g -value of $1.5 W/m^2K$ when used in a standard double IGU. At the same time, it will provide the highest degree of passive solar heat gain, free energy from the sun.



*Main Point Pankrac in Prague,
Czech Republic with LEED Platinum*

Pilkington **Optitherm™** is a range of off-line coated glass which offers the highest performance of thermal insulation. These products will provide Ug-values from as low as 1.0 W/m²K (Pilkington **Optitherm™** S1A and Pilkington **Optitherm™** S1 Plus) when used in a standard double IGU and 0.5 W/m²K when used in a triple IGU.

Pilkington **K Glass™** S is an off-line coated glass developed to provide a balance between low Ug-value for thermal insulation and high g value to maximise passive solar gain during colder periods.

The choice of glass combination will depend on the performances required, as well as the building location, orientation and area of glass.

In warm climates, solar control glass minimises heat entering the building, while still letting lots of natural daylight in. The best energy-efficient glazing combines solar control and thermal insulation in an IGU to enhance the performance, by reducing heat gain from direct solar radiation into the building due to the lower g value, as well as conduction and convection gains through the IGU from the hot outside environment to the air-conditioned inside.

The combination of solar control and low-emissivity in an IGU will help to reduce air-conditioning loads, save energy and reduce CO₂ emissions. This can be achieved by either using a single product which provides both solar control and low-emissivity in an IGU, or using a solar control product and a separate low emissivity product within an IGU.

Pilkington **Suncool™** is a range of high performance off-line coated solar control products with a wide range of visible light transmittance, reduced solar transmittance and excellent low-emissivity. The products range from 30 up to 71% light transmittance whilst achieving Ug-values down to 1.0 W/m²K, and g values as low as 19% in standard double IGUs. The excellent solar control properties of Pilkington **Suncool™** greatly reduce the need for air-conditioning and artificial lighting within a building, whilst its insulation properties can reduce heat loss, helping significantly to reduce the operational energy consumption of the building.

Renewable energy

Intent: To reduce the environmental and economic harms associated with fossil fuel energy and reduce greenhouse gas emissions by increasing the supply of renewable energy and carbon mitigation projects.

Credit application: 5 points

Our Value:

Solar panels can be used to harvest solar energy and supply buildings with electricity and heat. Glass is an integral and important element of most solar technologies currently available.

BIPV stands for Building Integrated Photovoltaics (BIPV) and refers to a building component which has been enhanced to perform as a renewable energy-generating material in addition to being an integrated part of the architecture and building facade. Examples include windows, spandrel glass and skylights.

Our latest development Pilkington **Sunplus™** BIPV provides power-generating, architectural glass solutions for both vertical and horizontal applications; allowing building proprietors and developers to turn buildings into power generating assets.

Pilkington **Sunplus™** BIPV combines the proven reliability and efficiency of crystalline silicon technology with the world's leading glass brand.

MATERIALS AND RESOURCES

Building Life-Cycle Impact Reduction

Intent: To encourage adaptive reuse and optimize the environmental performance of products and materials

Credit application: 2 - 6 points

Our Value:

Pilkington glass products can be used as replacement glass in buildings allowing for the use of the original frame in historic buildings.

Building Product Disclosure and Optimisation - Environmental Product Declaration

Intent: To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.

Credit application: 2 points

Our Value:

NSG has participated in and contributed to the generation of industry-wide Environmental Product Declarations (EPDs). We have EPDs for several products and are planning to extend the scope to cover additional products.

Building Product Disclosure and Optimisation - Sourcing of Raw Materials

Intent: To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner.

Credit application: 1 - 2 points

Our Value:

We are not a member of a third party certification scheme for responsible sourcing. However, many of the suppliers of our main raw materials, sand and soda ash, have third party certification to ISO 14001 for their environmental management systems.

Although current levels within the flat glass industry are low, we continue to seek to increase the levels of pre- and post-consumer recycled content in our manufacturing processes. We make active use of cullet in our processes to improve our environmental performance. Internal and pre-consumer cullet consists of broken glass generated from edge trimmings and off specification product, both from the flat glass and downstream processing activities. Internal cullet generated from the flat glass manufacturing process is reintroduced into the furnace and makes up approximately 20% of the raw materials used to manufacture flat glass (dependent upon product). The use of cullet is essential to the manufacturing of quality flat glass and has the benefit of improving the melt of other batch materials, reduces the amount of virgin material that must be extracted and generates net energy savings. Cullet also reduces atmospheric CO₂ from both fossil fuel combustion and carbonate raw material decomposition.

In addition to cullet, raw materials also include silica sand (one of the world's most abundant naturally occurring minerals) and other abundantly available minerals such as limestone.

Note that the internal cullet we reintroduce into our float glass manufacturing processes does not count towards pre-consumer recycled content.



Adgar Plaza in Warsaw, Poland with LEED Gold

Building Product Disclosure and Optimisation - Material Ingredients

Intent: To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

Credit application: 1 - 2 points

Our Value:

For flat and coated glass, we provide a published complete Health Product Declaration (HPD) with full disclosure of known hazards in compliance with the HPD Open Standard. Our HPD has been pre-checked for Material Ingredients Options 1 and 2.

INDOOR ENVIRONMENTAL QUALITY

Minimum Acoustic Performance (Prerequisite for Schools)

Intent: To provide classrooms that facilitate teacher-to-student and student-to-student communication through effective acoustic design

Acoustic Performance

Intent: To provide workspaces and classrooms that promote occupants' well-being, productivity, and communications through effective acoustic design.

Credit application: 1 - 2 points

Our Value:

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 special PVB (polyvinylbutyral) interlayer. With a large variety of product combinations, Pilkington **Optiphon™** offers the opportunity to achieve specific noise reduction requirements. A weighted sound reduction, R_w , in excess of 50 dB can be achieved with IGUs incorporating Pilkington **Optiphon™**.

Low-Emitting Materials

Intent: To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

Credit application: 1 - 3 points

Our Value:

In LEED, windows, shopfronts, other external glazing, etc., are considered part of the weatherproofing system and may be excluded from the calculation.

In general, glazing products do not contain any Volatile Organic Compounds (VOCs). As the manufacture of glass involves melting raw materials at temperatures above 1500°C, no organic compounds are present within the glass. Where components such as paint, sealants, adhesives, etc., that may contain VOCs are subsequently applied to glass, they are rarely exposed to indoor air.

Thermal Comfort

Intent: To promote occupants' productivity, comfort, and well-being by providing quality thermal comfort.

Credit application: 1 point

Daylight

Intent: To connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space.

Credit application: 1 - 3 points

Quality Views

Intent: To give building occupants a connection to the natural outdoor environment by providing quality views.

Credit application: 1 - 2 points

Our Value:

Increased glazed areas can help to improve indoor environmental quality. Advances in glass technology have made it possible to create vibrant interiors that connect the users with the outside world.

Glass is multi-functional; it can be used in vertical or roof applications, providing the same properties as any solid material, i.e. comfort, safety and/or security, as well as natural light and a view to the outside.

We offer several glass products with high light transmittance to maximise daylight. Pilkington **Optifloat™** Clear is our high quality clear float glass; it has a light transmittance of 91% in 4 mm. Pilkington **Optiwhite™** is our extra-clear low-iron glass that offers high light transmittance and clarity of view; its light transmittance is 92% in 4 mm. Furthermore, our low-emissivity glass range also offers products with medium-to-high light transmittance in addition to their low Ug-value as stated earlier (see also Optimise Energy Performance).

Pilkington **Optitherm™** range of products can even achieve 82% light transmittance in double IGUs and as much as 74% in triple IGUs.

Borgwarner in Jasionka, Poland with LEED Silver





One Albert Quay in Cork, Ireland with LEED Gold



Along with their excellent solar control and low-emissivity properties, the Pilkington **Suncool™** products offer a range of light transmittance up to 71% in a double IGU. When combined with Pilkington **Optiwhite™** extra-clear low-iron glass, they can achieve up to 73% light transmittance in a double IGU.

The use of Pilkington **Activ™** in vertical glazing, rooflights and skylights can help to ensure high levels of daylight transmittance, by providing an external glass surface free from dirt for longer periods than is the case of ordinary glass.

We also offer a range of glass systems. Pilkington **Planar™** structural glazing system and Pilkington **Profilit™** channel-shaped glass allow designers and specifiers to transform courtyards into cosy interiors, enclose private and public outdoor areas under glass roofs and build stunning glass façades. They help create building interiors which connect occupants with the external environment, combining unbroken views of the surrounding nature and high level of natural light with the comfort and safety of the internal environment.

Pilkington **Planar™** can be combined with any glass from the Pilkington range therefore providing the same light transmittance as any other glazing. Translucent rather than transparent, Pilkington **Profilit™** can offer up to 75% light transmittance in double skin applications while still providing impact safety. This product is ideal in applications such as sports centres which tend to lack natural daylight, as impact safety concerns normally restrict glazed areas.

Where other requirements (e.g. building regulations) dictate that fire resistance should be provided, the use of clear fire protection glass can help to maximize daylight.

Our range of clear fire-resistant products, Pilkington **Pyrostop®**, Pilkington **Pyrodur®** and Pilkington **Pyroclear®** help to provide a protected, yet comfortable and versatile state-of-the-art glazed building environment, founded on daylighting and clear vision complying with relevant fire safety regulations, avoiding non-transparent solid roofs, doors and partitions which block out views and natural light.

Project design should be considered to achieve requirements.

INNOVATION

Innovation

Intent: To encourage projects to achieve exceptional or innovative performance.

Credit application: 1 - 5 points

Our Value:

NSG has developed Pilkington **AviSafe™** to deter bird strikes on buildings, contributing to Pilot 55 credit: bird collision.

Pilkington **AviSafe™** is an innovative solution, developed to greatly reduce the number of bird collisions. The unique patterned UV enhanced coating disrupts the reflection on the glass, so the bird can see a barrier.

The reflection of vegetation, the sky, and other buildings are deceptive and can result in bird collisions. Birds in flight are unable to use visual signals such as window frames to distinguish the location of the glass, as a human would.

Unlike humans, many birds can see light in the ultraviolet spectrum. Therefore, the technologically advanced coating on Pilkington **AviSafe™** makes the glass more visible to birds while remaining aesthetically appealing on the exterior surface. From the inside however, it's barely visible to the human eye, unlike other solutions.

Pilkington **AviSafe™** has successfully passed the WIN test at Hohenau bird ringing station in Austria, meaning that it can be considered effective at reducing bird collisions.

Note: The number of credits available will depend upon the building category.

ABOUT NSG GROUP

The NSG Group is one of the world's largest manufacturers of glass and glazing products for the architectural, automotive and technical glass sectors.

With around 27 000 employees, we have principal operations around the world and sales in over 100 countries, and we operate in three main sectors:

Architectural supplies glass for Buildings and Solar Energy applications.

Automotive serves the Original Equipment, Aftermarket Replacement and Specialised Transport glazing markets.

Technical Glass is world leader in thin glass for display and various applications and optical devices for office machinery and glass fibre for battery separators and timing belts.

Glass is playing an important role in society's efforts to reduce greenhouse gas emissions and to mitigate the effects of climate change. We aim to be the global leader in innovative high-performance glass and glazing solutions, contributing to energy conservation and generation, while working safely and ethically.

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