



Sustainability in Roofing

Sika Solutions – Proven Competence



Innovation & Consistency | since 1910

Sika Solutions Contribute to a Sustainable Future





“Sika is committed to putting high-performance solutions into practice – to the benefit of our customers and for a sustainable development.”

In a marketplace that faces challenges such as higher costs for raw materials and energy, faster growth in emerging economies and growing global competition, it is vital to be able to innovate. Since its foundation in 1910, Sika has shown this ability repeatedly and will accelerate in doing so. It is in this interest that we invest in research.

In the future, this approach will remain crucial to our success, and we will anticipate and respond strongly to major challenges ahead such as energy and resource efficiency, climate change, water scarcity, efficient infrastructure and air quality. These challenges demand new solutions which are directly linked with our company's growth. Consequently we need to ensure that sustainability is integrated effectively into our management and business methods, our research and development strategy, marketing and sales activities, production processes and into our collaboration across company lines.

As a company with a strong innovative tradition, Sika not only develops creative solutions, we also engage in sharing this tradition across company lines with our partners in trade and industry. It is in this respect that we engage in the following programs:



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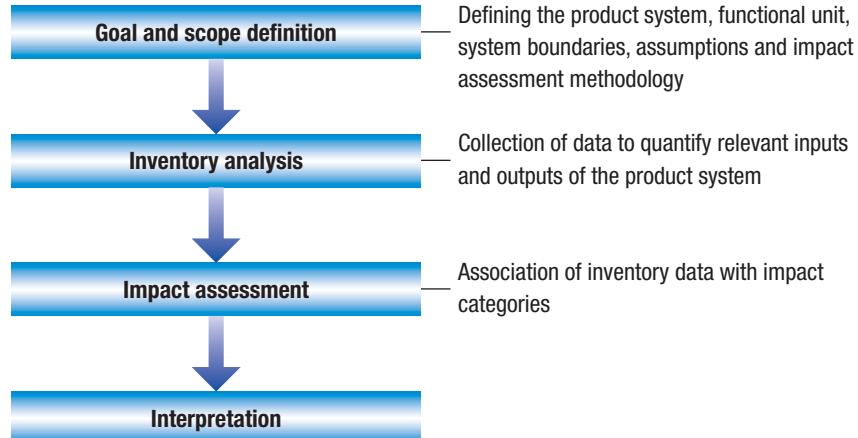
What Is Life Cycle Assessment and How Can I Measure It?



What is Life Cycle Assessment (LCA) and why is it relevant?

Life Cycle Assessment (LCA) is a standardized method to assess and compare the inputs, outputs and potential environmental impacts of products and services over their life cycle. LCA's are increasingly recognised as the tool to evaluate the sustainability of products and systems.

What are the steps to prepare an LCA?



What impact categories and resource indicators are included in an LCA?

There are several different impact categories and resource indicators which can be assessed with different methods. The impact categories and resource indicators to be presented according to the Standard EN 15804 Sustainability of construction works – Environmental product declarations – "Core rules for the product category of construction products", include the following:

Cumulative Energy Demand (CED)

Cumulative Energy Demand (CED) accounts for the consumption of energy resources, namely the total amount of primary energy from renewable and non-renewable resources.

Global Warming Potential (GWP)

Global Warming Potential (GWP) measures the potential contribution to climate change, focusing on emissions of greenhouse gases, such as carbon dioxide (CO_2), which enhance the heat radiation absorption of the atmosphere, causing the temperature at the earth's surface to rise.



**What impact categories and resource indicators are included in an LCA?
(continued)**

Photochemical Ozone Creation Potential (POCP)

Photochemical Ozone Creation Potential (POCP), or summer smog, is the formation of reactive chemical compounds, e.g., ozone, by the action of sunlight on volatile organic compounds (VOC) and nitrous oxides (NO_x). It is common in large cities, where high amounts of VOC and NO_x are released (e.g., industrial and automobile emissions), especially during summer when there is more sunlight. Summer Smog may be harmful to human health and ecosystems.

Use of Net Fresh Water

The use of net fresh water accounts for the consumption of fresh water (e.g., feed water, ground water, lake water, river water, surface water, water with river silt).

Eutrophication Potential (EP)

Eutrophication is the excessive enrichment of aquatic or terrestrial ecosystems with nutrients, nitrogen and phosphorus being the most important, which may cause an adverse shift in species composition and biomass production.

Acidification Potential (AP)

The acidification potential describes the conversion of air pollutants, such as sulphur dioxide (SO_2), into acids, which have a wide variety of impacts (e.g., in form of acid rain) on soil, water, organisms and materials.

Ozone Depletion Potential (ODP)

Ozone depletion refers to the degradation of the ozone layer due to anthropogenic emissions, such as chlorofluorocarbons (CFCs). This allows a greater fraction of UV-B radiation to reach the earth's surface, with potentially harmful impacts on human health, organisms and materials.

Abiotic Depletion Potential (ADP elementary and ADP fossil)

Abiotic resources are natural resources such as minerals, iron ore, crude oil and wind energy. The ADP elementary impact category includes all non renewable, material resources, while the ADP fossil category includes all fossil resources, including feedstock.

Are “Carbon Footprint” and Global Warming Potential (GWP) the same?

Yes, the Carbon Footprint is the sum of the total greenhouse gases emitted (directly and indirectly) expressed in kg CO_2 -equivalents. GWP is the corresponding impact category of an LCA.

The Sika Life Cycle Approach



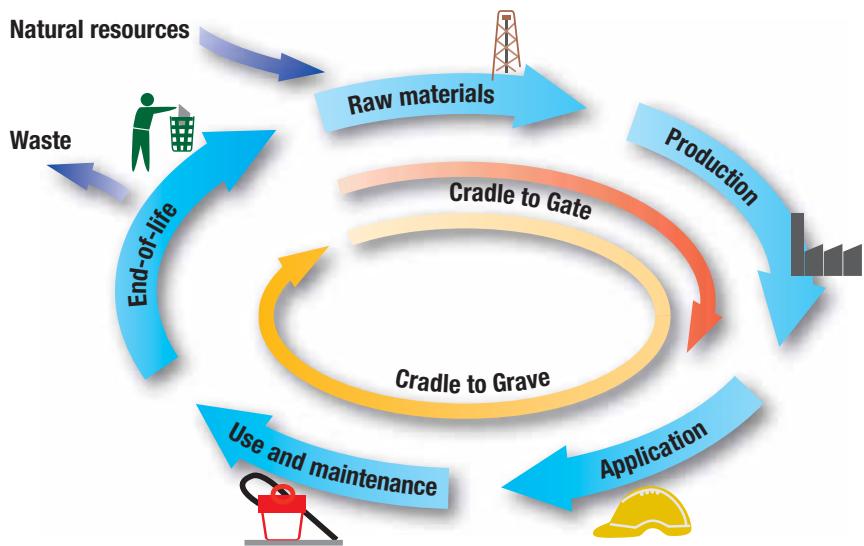
On what standards are Sika LCA's based?

Sika carries out LCA's according to the ISO 14040 series and the Standard EN 15804. The impact assessment methodology used is CML 2001.

Where does the Sika LCA data come from?

The data for the Sika LCA is based on public databases, such as those from ecoinvent, the European Reference Life Cycle Database (ELCD) and PE-GaBi, plus the specific data from Sika production plants and products.

Which life cycle phases are included in these Sika LCA's?



What does Cradle to Gate mean?

In a "Cradle to Gate" approach, the LCA investigates the potential environmental impact of a product from raw material extraction to finished production.

What does Cradle to Grave mean?

In a "Cradle to Grave" approach, the LCA investigates the potential environmental impact of a product from raw material extraction, production, application and use to final disposal at the end-of-life.



The Sika Contribution to Sustainable Construction



How can the Sika LCA data be used / interpreted?

The LCA can greatly assist our customers in evaluating Sika's products and systems namely by providing quantitative data on their environmental profile. This enables the differentiation of products that may have similar performance, but greater differences concerning their environmental impact – where obviously the lower, the better.

How can Sika contribute to sustainable construction?

Sika evaluates its products systematically with regard to all of the major challenges and based on regular and fully comprehensive Life Cycle Assessments.



Energy efficiency solutions

Sika products and systems which contribute to reducing the energy demand over the entire value chain.



Resource efficiency solutions

Sika products and systems which contribute to reducing the resource demand over the entire value chain.



Climate protection solutions

Sika products and systems which contribute to reducing the carbon emissions over the entire value chain.



Water efficiency solutions

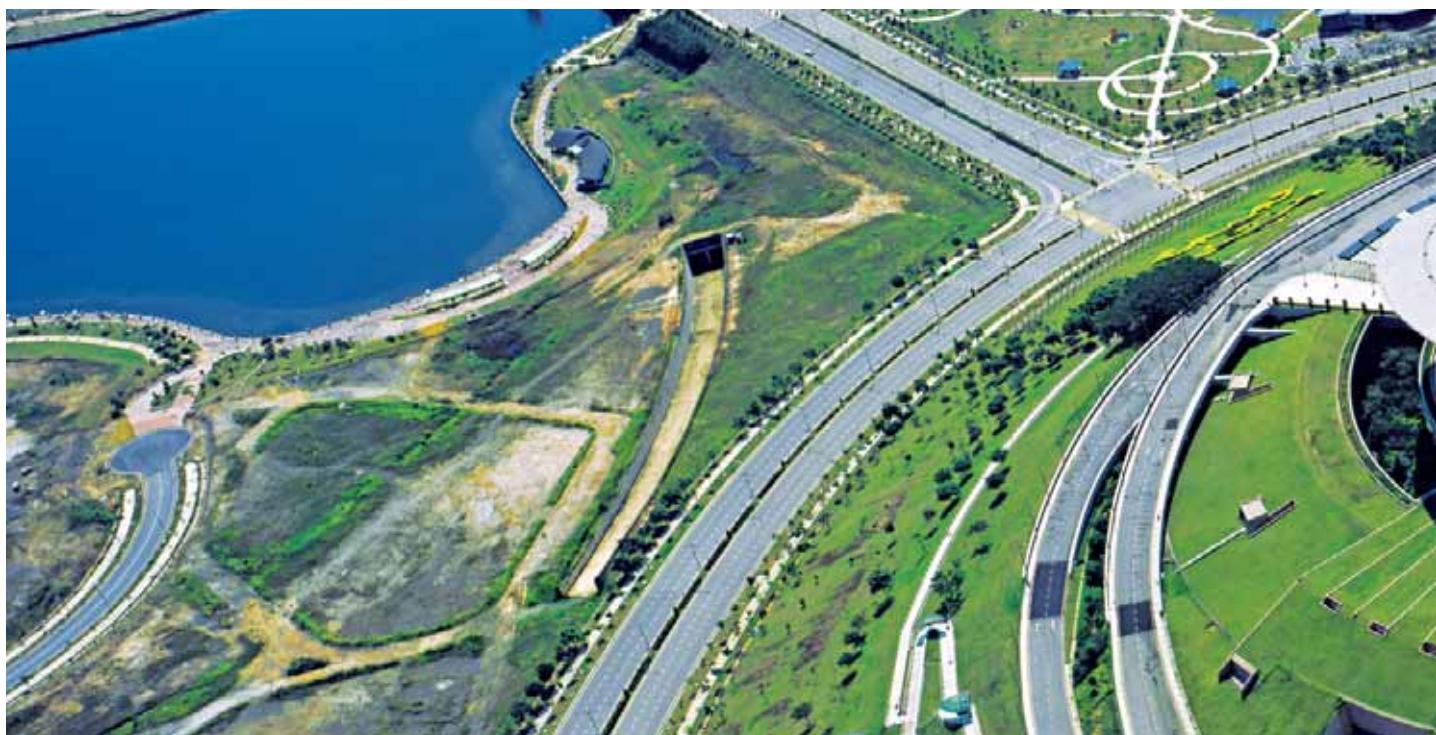
Sika products and systems which contribute to reducing the water demand over the entire value chain.



Air quality solutions

Sika products and systems which contribute to reducing summer smog and the emission of air pollutants and hence improve the well-being of people and ecosystems over the entire value chain.

The Sika Life Cycle Approach to Roofing



The Sika Roofing Life Cycle Approach

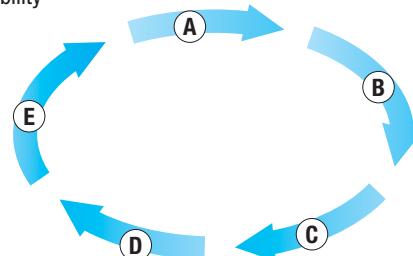
Which impact categories and resource indicators are most relevant for roofing?

As a standard approach, Sika evaluates all impact categories and resource indicators deemed as important according to the relevant standards. For Roofing Cumulative Energy Demand (CED), Global Warming Potential (GWP), and Photochemical Ozone Creation Potential (POCP) are considered to be most relevant. Others, such as Use of Net Fresh Water are less significant for Roofing and hence not included in this publication.

Which life cycle phases are most relevant for roofing?

From a **Cradle to Gate** perspective, the majority of the potential impacts are connected to the raw materials **(A)** that are used to produce **(B)** the roof waterproofing layer and the other roofing system components.

From a **Cradle to Grave** perspective, the use phase **(D)** and the end-of-life phase **(E)**, have the most significant influence on the overall sustainability performance of roofing applications, due to their contributions to save and / or create energy, to avoid carbon emissions and to save resources at the end-of-life. The leverage of all of these potential benefits is a long lasting functionality and durability.



What is included in the Sika roofing LCA's?

The LCA data in this brochure refers to 1 m² of the roofing systems/membrane and is either based on a cradle to gate, or on a cradle to grave approach ¹⁾.

Who performed and reviewed the Sika roofing LCA's?

The Sika Roofing LCA's have been performed internally by the Sika Corporate Product Sustainability Group, using the state of the art GaBi software from PE International. The LCA model was reviewed by the leading independent research institute Swiss Federal Laboratories for Materials Science and Technology (EMPA).

¹⁾ In the LCA's, neither the roof construction (steel deck, concrete deck, soil, plants etc.), nor capital goods (e.g. machinery) were considered.



How Can Sika Roofing Systems Contribute to Sustainable Construction?



(A) Raw material and production:

Energy and resource efficient roofing systems: Sika provides roofing systems that use less energy and resources by comparison with competitive technologies.

Climate protection roofing solutions: Sika provides roofing systems with a low Global Warming Potential. This means a reduced Carbon Footprint.



(C) Application:

Air quality roofing solutions: Sika can provide low Volatile Organic Compound (VOC) and VOC-free roofing options, which help to avoid summer smog.



(D) Use and maintenance:

Saving energy: Sika roofing systems can save energy by incorporating high performance thermal insulation.

Saving energy: Sika solar reflective membranes help save energy by increasing the albedo and as a consequence reducing the cooling energy demands and contributes to the reduction of the urban heat island effect.



(E) End-of-life:

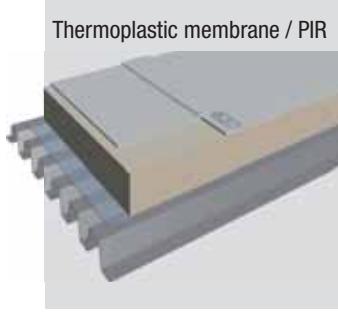
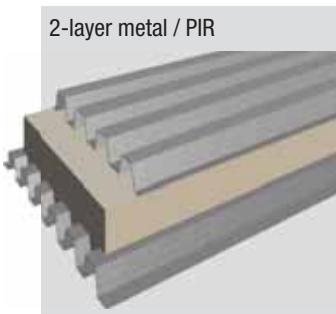
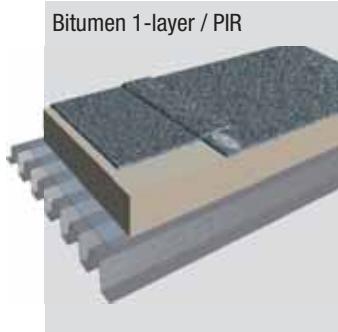
Improving the microclimate: Sika green roofing systems help to improve the microclimate and to mitigate the development of urban heat islands and help manage water run-off from roofs.

Recycling: Recycling at the end-of-life means closing the material cycle which allows the saving resources.

Descriptions of Roofing Systems Covered in the LCA's



Mechanically Fastened Roofs

Design / Build-up	System	Design / Build-up	System
	<p>Thermoplastic membrane / PIR</p> <p>Sarnafil® TS 77-15 mechanically fixed with Sarnafast® SF 4,8 mm and Sarnafast® Washer KT</p> <ul style="list-style-type: none">- FPO membrane- PIR insulation 135 mm- Vapour control layerSarnavap® 2000 E- Steel deck		<p>EPDM 1.5 mm / PIR</p> <ul style="list-style-type: none">- EPDM 1.5 mm mechanically fixed with fasteners and washers- PIR insulation 135 mm- Vapour control layer PE 0.3 mm- Steel deck
	<p>Thermoplastic membrane / PIR</p> <p>Sikaplan® 15 G mechanically fixed with Sarnafast® SF 4,8 mm and Sarnafast® Washer KT</p> <ul style="list-style-type: none">- PVC membrane- PIR insulation 135 mm- Vapour control layerSarnavap® 2000 E- Steel deck		<p>2-layer metal / PIR</p> <ul style="list-style-type: none">- Top layer metal panel, steel- Fixings and spacers- PIR insulation 135 mm- Base layer metal panel
	<p>Bitumen 1-layer / PIR</p> <ul style="list-style-type: none">- 1-layer modified bitumen 5.2 mm, mechanically fixed with fasteners and washers- PIR insulation 135 mm- Vapour control layer PE 0.3 mm- Steel deck		

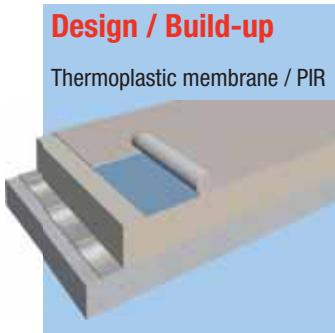
LCA comparison of popular roofing systems and technologies: in order to allow correct comparison, the comparison of all of the roofing systems is based on the same thermal insulation type (PIR/PUR boards), with the same thermal resistance ($R_d = 5 \text{ (m}^2 \cdot \text{K) / W}$). The only exception is the **SikaRoof® MTC Green** (inverted roof), which includes extruded polystyrene (XPS) thermal insulation for technical reasons.



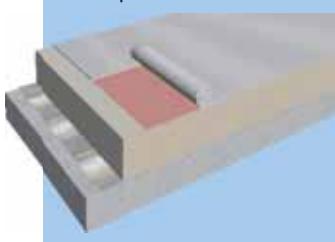
Adhered Roofs

Design / Build-up

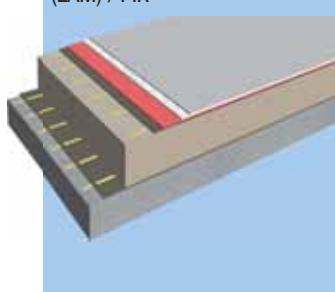
Thermoplastic membrane / PIR



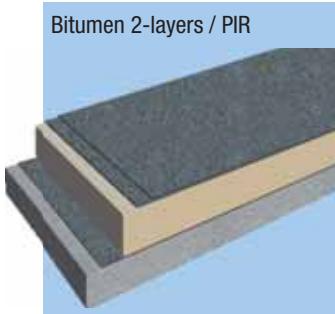
Thermoplastic membrane / PIR



PU liquid applied membrane (LAM) / PIR



Bitumen 2-layers / PIR



System

- FPO membrane

Sarnafil® TG 76-15 Felt
adhered to the insulation with
Sarnacol® 2142 S

- PIR insulation 135 mm bonded to the vapour control layer with
Sarnacol® 2162
- Self adhesive vapour control layer

Sarnavap® 5000E SA

- Concrete deck

- PVC membrane

Sarnafil® G 410-15 EL Felt adhered to the insulation with
Sarnacol® 2170

- PIR insulation 135 mm bonded to the vapour control layer with
Sarnacol® 2162
- Self adhesive vapour control layer

Sarnavap® 5000E SA

- Concrete deck

SikaRoof® MTC Cold Fusion

- Top coat **Sikalastic®-621 TC**
- Reinforcement with **Sikalastic® Reemat Premium**
- Base coat
Sikalastic®-601 BC
- **Sikalastic® Carrier**
- PIR insulation 135 mm bonded to the VC layer with
Coldstick®
- Control layer **Sikalastic® Vap** adhered with **Coldstick®**
- Concrete deck

- 2-layers modified bitumen (5.0 and 3.5 mm)

- PIR insulation 135 mm bonded to the vapour control layer with adhesive
- Vapour control layer mod. bitumen 2.7 mm
- Primer
- Concrete deck

Green Roofs

Design / Build-up

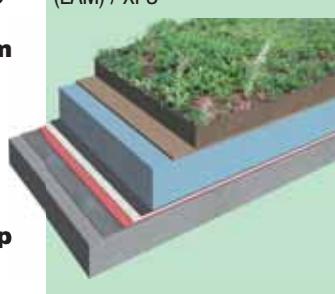
Thermoplastic membrane / PIR



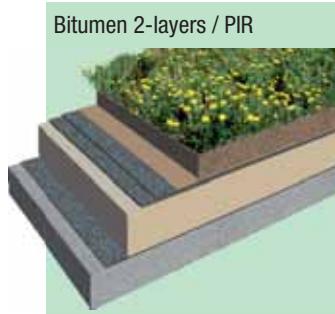
Thermoplastic membrane / PIR



PU liquid applied membrane (LAM) / XPS



Bitumen 2-layers / PIR



System

- Soil with plants

- Drainage layer **Sarnavert® Aquadrain 550**

- FPO membrane
Sarnafil® TG 66-15
- PIR insulation 135 mm
- Vapour control layer mod. bitumen 3,5 mm
- Concrete deck

- Soil with plants

- Drainage layer **Sarnavert® Aquadrain 550**

- PVC membrane
Sarnafil® G 476-15
- PIR insulation 135 mm
- Vapour control layer mod. bitumen 3,5 mm
- Concrete deck

SikaRoof® MTC Green

- Soil with plants
- Drainage layer **Sarnavert® Aquadrain 550**
- XPS insulation 185 mm
- Top coat **Sikalastic®-621 TC**
- Reinforcement **Sikalastic® Reemat Premium**
- Base coat
Sikalastic®-601 BC
- **Sikalastic® Carrier Membrane** adhered with **Coldstick®**
- Concrete deck

- Soil with plants

- Drainage layer
- 2-layers modified bitumen (5.0 and 3.5 mm)
- PIR insulation 135 mm
- Vapour control layer mod. bitumen 2.7 mm
- Concrete deck

LCA Results for Cumulative Energy Demand (CED)

Challenge:

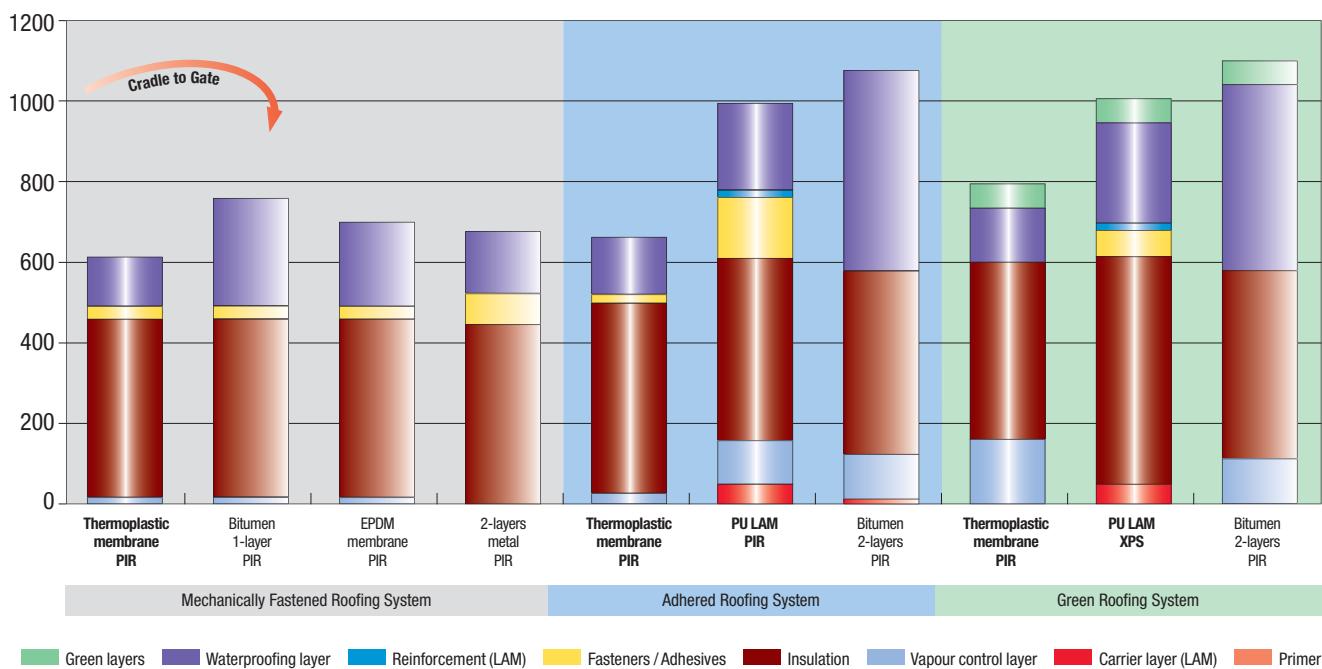
The demand for limited resources is increasing.

Worldwide the demand for resources including oil, coal, natural gas, iron ore and copper is increasing, driven by a growing population and higher spending and purchasing powers. On the other hand, these resources are limited, or their extraction is getting more and more costly. Efficient and intelligent use of limited resources is one of the main challenges for future growth.



LCA Results for Popular Roofing Systems ¹⁾

Cumulative Energy Demand (CED) for 1 m² roofing system [MJ/m²]



You can contribute to saving energy and resources by choosing Sika roofing solutions that:

- Have the lowest CED of all of the roofing systems compared (Energy & Resource Efficiency Solutions)
- Have a wide range of both sustainable and cost effective roofing systems to match your requirements
- Provide superior durability, together with additional benefits in the use phase

¹⁾ LCA values may vary, depending on the products formulation (e.g. due to local fire regulations) and production site, as well as on the datasets from the available LCA databases. The values for the thermoplastic roof build-ups are based on the average of the two systems described for the corresponding application.

LCA Results for Global Warming Potential (GWP)

Challenge:

The climate is changing faster than ever before.

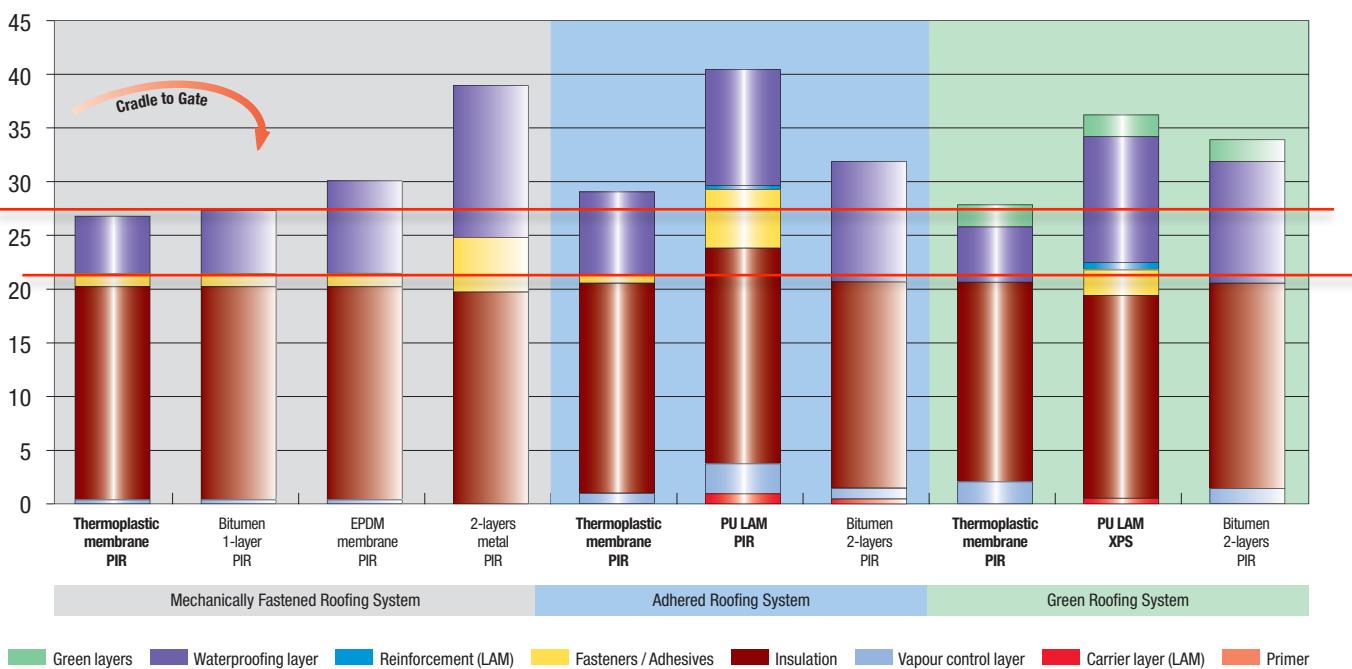
The earth's climate is changing faster than ever before. The consequences are manyfold and affect us all. Climate protection is one of the most important tasks for the future. By 2050 the world will have to reduce its greenhouse gas emissions by 80%. To act now is crucial, because a complete overhaul of currently used energy systems needs to be financed and realized within less than two generations.

Decisive action is needed urgently.



LCA Results for Popular Roofing Systems ¹⁾

Global Warming Potential (GWP) for 1 m² roofing system [kg CO₂-eq./m²]



You can contribute to protecting our climate by choosing Sika roofing solutions that:

- Have the lowest GWP of all of the roofing systems compared (Climate Protection Solutions)
- Have a wide range of both sustainable and cost effective roofing systems to match your requirements
- Provide superior durability, together with additional benefits in the use phase

¹⁾ LCA values may vary, depending on the products formulation (e.g. due to local fire regulations) and production site, as well as on the datasets from the available LCA databases. The values for the thermoplastic roof build-ups are based on the average of the two systems described for the corresponding application.

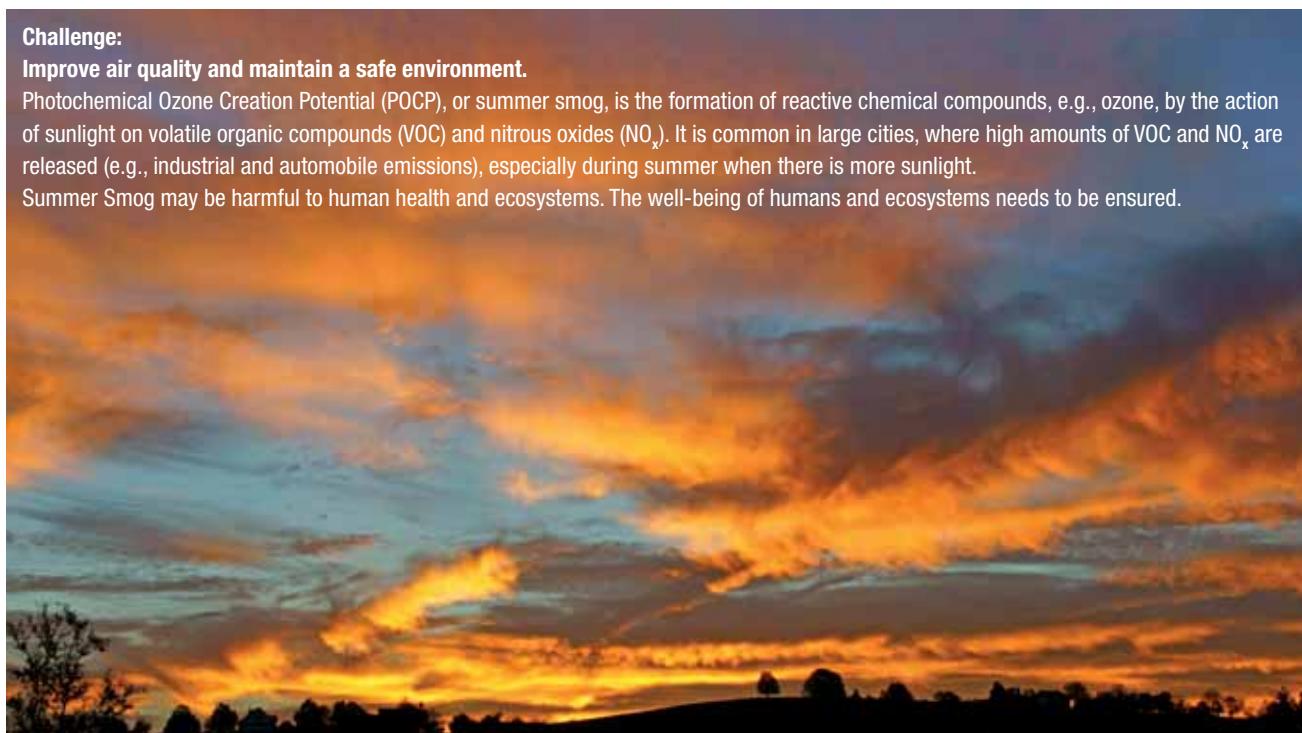
LCA Results for Photochemical Ozone Creation Potential (POCP)

Challenge:

Improve air quality and maintain a safe environment.

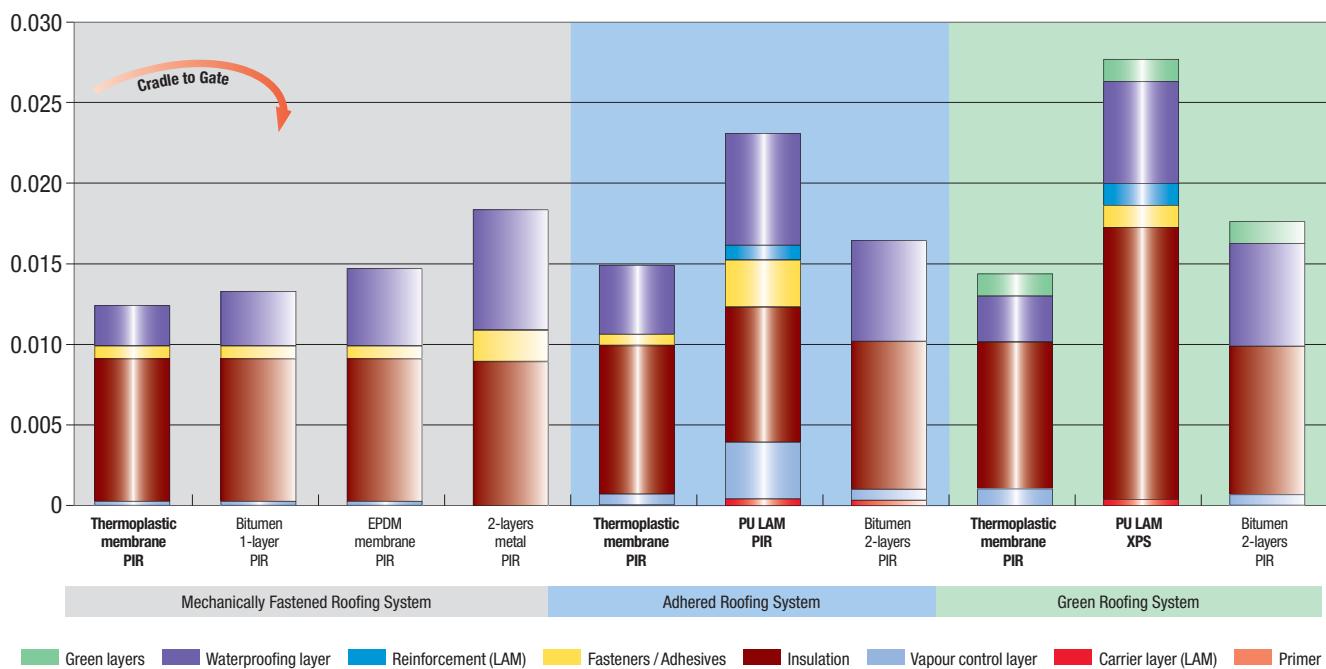
Photochemical Ozone Creation Potential (POCP), or summer smog, is the formation of reactive chemical compounds, e.g., ozone, by the action of sunlight on volatile organic compounds (VOC) and nitrous oxides (NO_x). It is common in large cities, where high amounts of VOC and NO_x are released (e.g., industrial and automobile emissions), especially during summer when there is more sunlight.

Summer Smog may be harmful to human health and ecosystems. The well-being of humans and ecosystems needs to be ensured.



LCA Results for Popular Roofing Systems ¹⁾

Photochemical Ozone Creation Potential (POCP) for 1 m² roofing system [kg C₂H₄-eq./m²]



You can contribute to reducing the summer smog by choosing Sika roofing solutions that:

- Have the lowest POCP of all of the roofing systems compared (Air Quality Solutions)
- Provide superior durability, together with additional benefits in the use phase
- Use VOC free adhesive options (e.g., Sika waterbased adhesive)

¹⁾ LCA values may vary, depending on the products formulation (e.g. due to local fire regulations) and production site, as well as on the datasets from the available LCA databases. The values for the thermoplastic roof build-ups are based on the average of the two systems described for the corresponding application.

Conclusions from the LCA Results



Conclusions from the LCA Results for Popular Roofing Systems: Cradle to Gate



Energy efficiency solutions

- Sika roofing systems based on thermoplastic PVC and FPO single ply membranes have a lower Cumulative Energy Demand (CED) than other roofing technologies. This holds true for mechanically fastened, adhered as well as for green roofing systems.
- You can contribute to saving energy by choosing high performance and low impact Sika roofing systems.



Resource efficiency solutions

- Same as Energy Efficiency, Resource Efficiency is measured by the Cumulative Energy Demand (CED).
- Sika roofing systems based on thermoplastic PVC and FPO single ply membranes have a lower Cumulative Energy Demand (CED) than other roofing technologies and classify as Resource Efficiency Solutions.



Climate protection solutions

- Sika thermoplastic PVC and FPO single ply roofing systems have a lower Global Warming Potential (GWP) compared to the other roofing technologies. This means a reduced Carbon Footprint for a solution that is here to last.



Air quality solutions

- Sika roofing systems based on thermoplastic PVC and FPO single ply membranes have a distinctly lower Photochemical Ozone Creation Potential (POCP) than the other roofing technologies compared. This means reduced summer smog potential.
- You can contribute to preventing summer smog by choosing high performance and low impact Sika roofing systems.

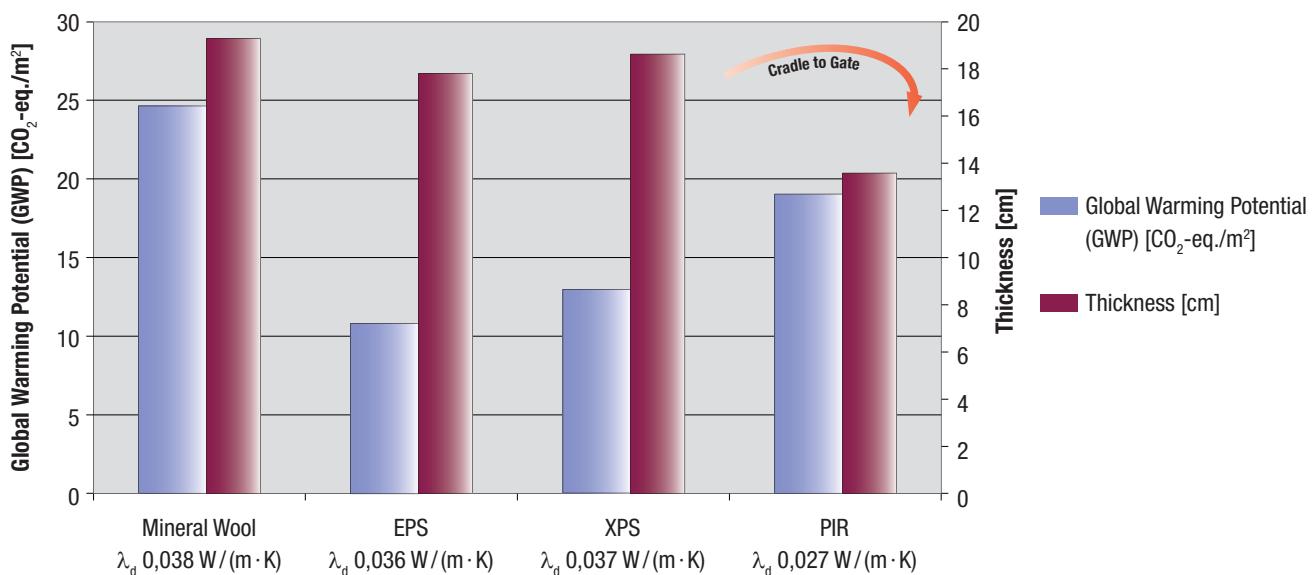
Saving Energy – Thermal Insulation



High Performance Thermal Insulation

Thermal insulation is the key to creating a comfortable environment inside of a building. At the same time, it is also the key to saving energy. Sika provides a wide range of thermal insulation specially designed and manufactured for optimal performance as part of the Sika roofing systems.

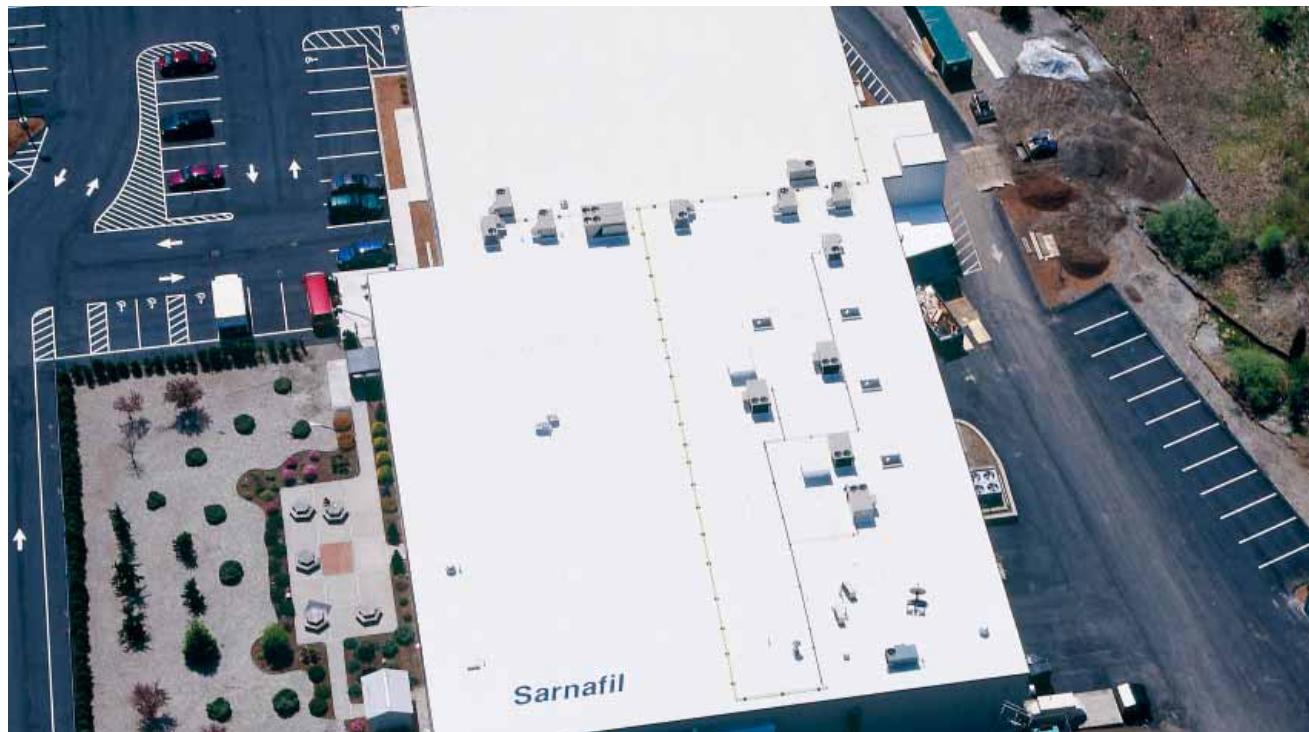
Global Warming Potential (GWP) and thickness of different insulation materials to provide a thermal resistance of $R_d = 5 \text{ (m}^2\cdot\text{K})/\text{W}$ ¹⁾



Thermal insulation performance: expanded polystyrene (EPS) materials have the lowest Global Warming Potential (GWP) for a given thermal performance, whilst mineral wool based systems have the highest GWP, but they have the advantage of being non-combustible. Polyisocyanurate (PIR) materials have the best thermal performance for a given thickness of insulation.

¹⁾ Corresponds to U-value $\sim 0,2 \text{ W/(m}^2\cdot\text{K)}$, a typical value for central Europe

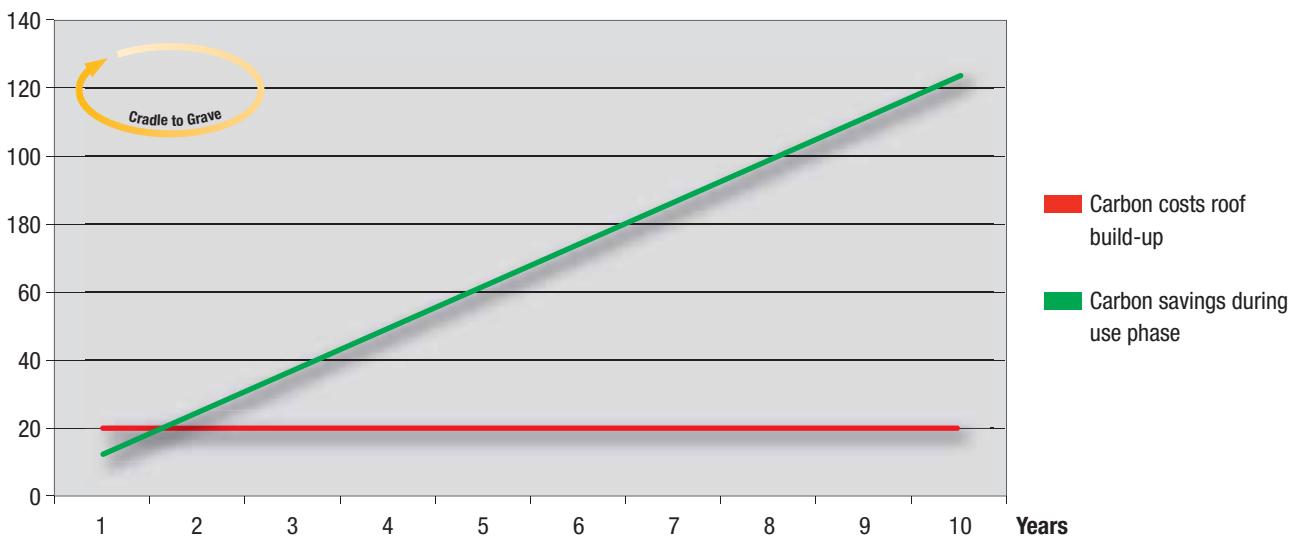
Saving Energy – Solar Reflective Roofs



Sika Takes Solar Reflectivity to a New Level

The benefits of solar reflective materials and colours are well known and understood, especially in warm climates around the world. With urban density increasing, the heat island effect is also impacting on cities at an ever increasing rate. White highly reflective membranes dramatically increase reflectivity and reduce both the heat island effect and the cooling energy consumption requirements for buildings. Sika roofing systems include highly reflective, white, thermoplastic membranes with an initial reflectivity SRI = 111% (Solar Reflectance Index) and PU liquid applied membranes with a similar SRI = 110% – contributing to your Green Building Certification rating.

Break-even diagram showing the carbon costs of a roofing system: Global Warming Potential (GWP) [kg CO₂-eq./m²]



Roof build-up: Thermoplastic **Sarnafil® S 327-15 EL** traffic white 9016 SR, mineral wool with $R_d = 2$ (m²·K)/W, vapour barrier ¹⁾

Case study of a project in Seville, Spain: this example compares a roof build-up with the highly reflective **Sarnafil® S 327-15 EL SR** membrane (initial reflectivity SRI = 111%) to a black roofing membrane. After a period of less than two years, the CO₂ that was spent for raw materials, production, installation and end-of-life, is compensated by the CO₂ saved due to reduced cooling energy demands inside the building.

¹⁾ End-of-life scenario: recycling for membrane, landfill for mineral wool, incineration for vapour barrier

Generating Energy – Sika SolaRoof®



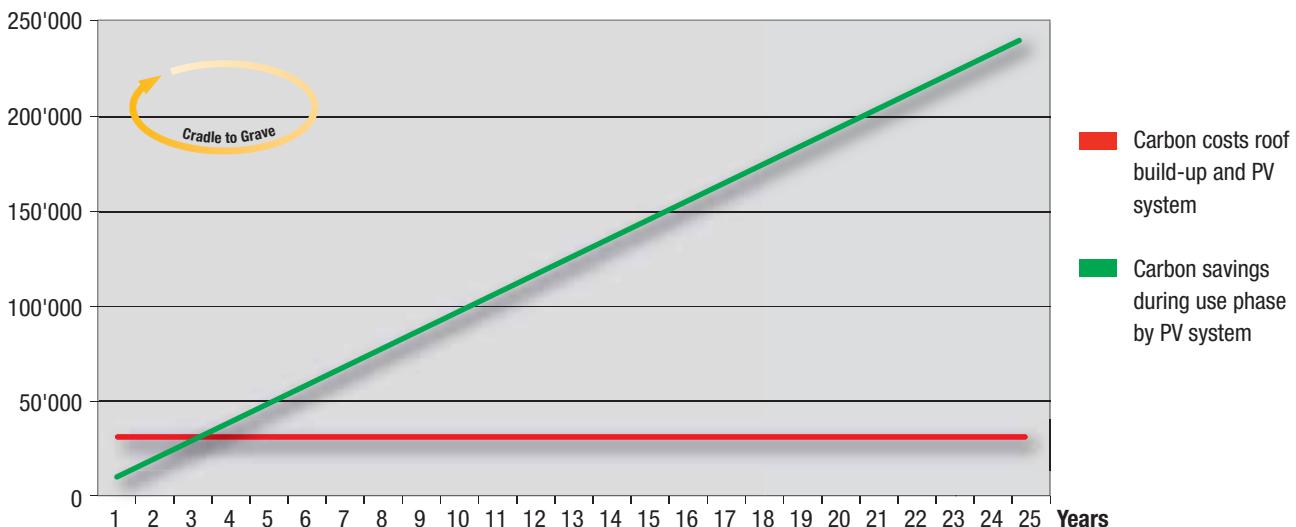
Sika Solar Park, Stuttgart, Germany

Sika SolaRoof® – Systems and Services for Rooftop Solar Applications

The importance of rooftop solar applications was recognized early by Sika, because its Solar Reflective (SR) membranes can increase the performance of Photovoltaic (PV) panels. Sika now maintains our own Solar Parks in several locations using different technologies to:

- Monitor the energy yield of different PV technologies
- Collect first-hand experience about their long term performance
- Showcase the flexibility of Sika roofing systems in conjunction with PV applications
- Provide a platform for [our](#) PV technology partners and other interested parties

Break-even diagram showing the carbon costs of the roofing and the PV system: Global Warming Potential (GWP) [kg CO₂-eq./ 236 m²]



Roof build-up: cylindrical CIGS PV panels, thermoplastic **Sarnafil® TS 77-20 E** traffic white 9016 SR, mineral wool with $R_d = 3$ (m²·K)/W, vapour barrier ¹⁾

Case study at the Sika Solar Park in Stuttgart, Germany (236 m² roof area): the example shows that after only 3 years, the cumulative CO₂ savings by the Photovoltaic (PV) system are higher than the CO₂ that was used for the raw materials, production and installation of both the roof build-up and the PV system. Sika's SR membranes significantly increase the PV panel's efficiency and thus contribute to reducing the carbon payback time.

¹⁾ End-of-life scenario: recycling for membrane and PV system, landfill for mineral wool and vapour barrier

The Advantages Are Growing – Sika Green Roofs



A Natural Habitat on Your Roof

The addition of a green roof to an otherwise unused area of a building is beneficial for the surrounding environment – and can contribute to your Green Building Certification rating. Initial loss of “green” space and its inherent natural processes like photosynthesis are restored, now just a few stories higher. But green roofs also have other benefits that you might not be aware of:



Storm-water retention

During heavy rainfall, run-off from hard / dense surfaces such as pavements and rooftops can cause serious problems such as sewers overflowing and fresh water pollution. Green roofs slow down this water flow by retaining up to 75% of the rainwater, thus alleviating the pressure on storm water and drainage infrastructure.

Reducing the urban heat island effect

More green roofs and fewer dark coloured roofs equal a cooler city. Dark roofs retain heat whilst plants naturally cool the surrounding environment through their evapotranspiration cycles. In cities where the ambient temperature can be up to 10 degrees hotter than in the surrounding rural areas, green roofs can help to bring the overall temperature down – thus contributing to a healthier micro-climate.

Reducing energy consumption

Green roofs are also great insulators and can very significantly lower a building's cooling energy consumption and costs, particularly in the summer months.

Improving air quality

Green roofs filter air by absorbing and converting carbon dioxide to oxygen.



Durability – Performance for Decades

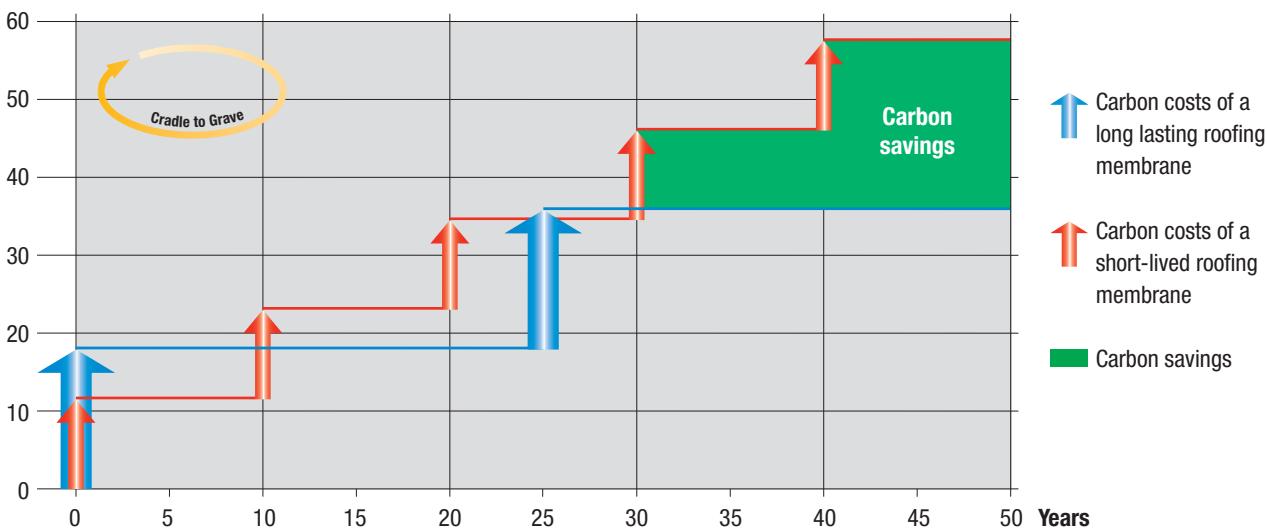


Victorinox headquarters, Switzerland, Sarnafil S327, 1978

Investing in Quality Means Saving More and for Longer

The durability of building materials is a key driver for sustainable building construction. Internal and external studies have documented the outstanding service life of **Sarnafil®** and **Sikaplan®** roofing systems. As an example, "The British Board of Agrément (BBA)", certifies thermoplastic **Sarnafil® G/S** ≥ 1.5 mm membranes to have a life expectancy that is "in excess of 40 years". On the other hand, **SikaRoot® MTC** liquid membranes are an outstanding refurbishment solution, allowing to extend the lifetime of existing roofs. They may simply be applied over the waterproofing layer, as they are compatible with most existing roofing materials. At the end of the life expectancy they may also be simply recoated to extend the service life even further. Investing into quality is a smart choice – it means saving more and for longer: saving costs as well as saving energy and resources due to fewer replacements and less maintenance of the roofing system over time.

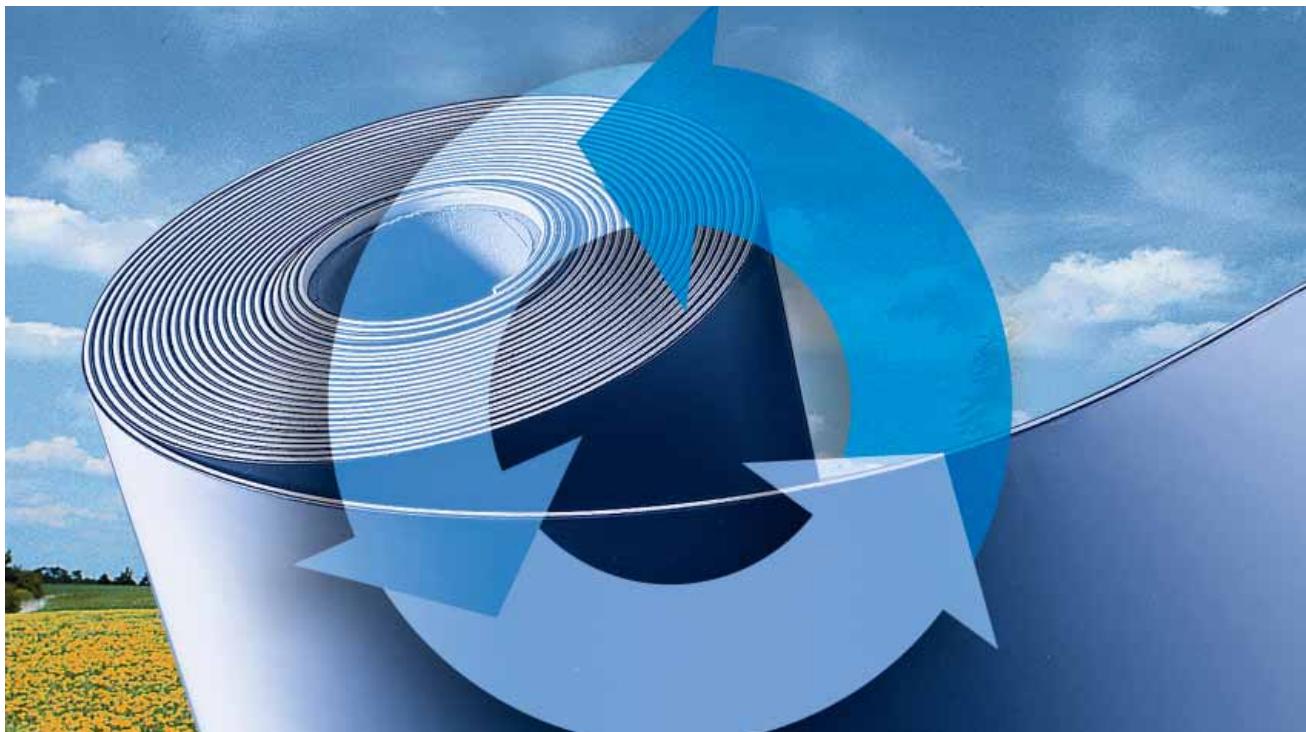
Global Warming Potential (GWP) of two thermoplastic roofing membranes with different service life [kg CO₂-eq./m²]



Case study of the comparison between long lasting and short-lived roofing membranes for a building over a period of 50 years: this study is based on the assumption that a short-lived generic waterproofing membrane lasts 10 years on average and hence will be replaced four times over the course of 50 years, whilst a high quality Sika roofing membrane lasts 25 years and only needs to be replaced once¹⁾.

¹⁾ End-of-life scenario: incineration

Recycling – Closing the Material Cycle



Recycling – the Smart Choice

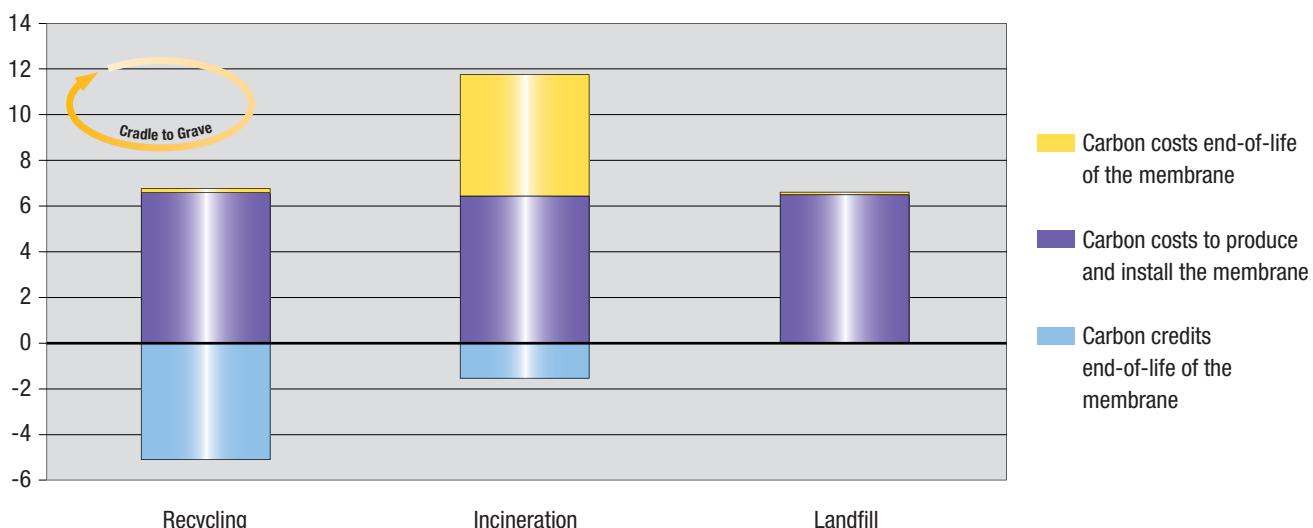


Recycling of production waste: Sika has been recycling production waste and roll edge trimmings since the 1960's.

Recycling of post-consumer waste (end-of-life): Sika was a pioneer in the development of recycling for used roofing membranes and actively participates in the end-of-life recycling program ROOFCOLLECT, the European collection and recycling initiative for roofing and other waterproofing membranes. In the US, Sika has successfully introduced a recycling program for commercial roofing membranes.

Innovative products made from recycled materials: production waste and post-consumer membranes are recycled into new products, such as protection sheets and walkway pads.

Global Warming Potential (GWP) of three end-of-life scenarios for a Sika thermoplastic PVC membrane [kg CO₂-eq./m²]



Case study for three end-of-life scenarios: three end-of-life scenarios were modelled for a mechanically fastened Sika thermoplastic PVC membrane: recycling (through shredding and regranulation), incineration and landfill. The results show that recycling is clearly the best solution, giving credits for avoiding additional raw materials that are almost as high as the original costs for production and installation of the membrane. Incineration generates additional CO₂, even if there are credits to be gained from using the incineration as a source of energy.

VOC in Roofing



The Sika Responsibility for Health & Environment

Sika is a responsible company and takes your health and safety seriously

Traditionally one of the major risks the roofing industry faces is the danger associated with using open flames during installation on-site. Gas torches, bitumen boilers, etc., all present such a fire hazard that many authorities and owners, together with their insurance companies, are now banning the use of flame applied systems on their roofs. Sika roofing systems are all developed as "no flame" applications and hence are completely free of such risks.

What are VOC's?

VOC is the standard abbreviation for "Volatile Organic Compounds" – chemicals with a significant vapour pressure. While VOC's are typically not always toxic, they can frequently have a potentially negative long term health impact and may also have an adverse effect on the environment.

Why do some products contain solvents (VOC)?

VOC's are contained in solvents that are commonly used in many products, such as paints or adhesives. The solvents are used so that the product can be supplied in a liquid form to facilitate its application on the surface. During the application and for a short period afterwards, the solvent will evaporate as a result of the materials drying and curing process. Solvent containing products offer benefits in the application during cold weather.

Health & Safety during application

Sika roofing products are all designed for outdoor application. Any product with a VOC content are designed to allow this to evaporate during application, where the free movement of air across the rooftop disperses the VOC rapidly. Sika products are compliant with the latest Health & Safety regulations ¹⁾. Furthermore, independent studies conclude that the exposure to solvents during application remain well below the allowed workplace exposure levels. The application of VOC containing Sika products is therefore safe when carried out in accordance with the materials application guidelines and the Product Data Sheets ²⁾.

Low VOC and VOC free roofing solutions

Innovative since its foundation 100 years ago, Sika has developed low VOC and VOC free roofing systems for markets and customers who want to avoid any products containing such solvents.

¹⁾ Exceptions may apply. Please refer to the Product Data Sheets or your local Sika organization.

²⁾ Local health and safety regulations must be followed. For further information please refer to the Product Data Sheets or your local Sika organization.

Innovative VOC Free Roofing Solutions



Examples of VOC Free Sika Roofing Adhesives

Innovative since its foundation 100 years ago, Sika offers a number of low VOC and VOC free roofing options for bonding thermal insulation and membranes to the substrates.



Membrane adhesives

Sarnacol® waterbased contact adhesive for thermoplastic **Sarnafil®** and **Sikaplan®** PVC membranes ¹⁾

- VOC free
- Suitable for most of the common substrates on roofs
- Efficient and clean application

Sarnacol® waterbased adhesive



Sarnacol® hot melt adhesive and spray tool

Sarnacol® VOC free spray adhesive for upstands with thermoplastic **Sarnafil®** FPO membranes ¹⁾

- VOC free
- Efficient and clean to apply
- Adhesive can be reactivated



Sikalastic® insulation adhesive

Thermal insulation adhesives

Sikalastic® two component adhesive ¹⁾

- VOC free
- Efficient and clean application

¹⁾ Please check the availability of the above mentioned adhesives with your local Sika organization.

Sika Roofing Solutions Contribute to a Sustainable Future



Sika Sustainable Roofing Solutions



Energy efficiency solutions

- **Cradle to Gate:** the LCA's performed show that Sika thermoplastic PVC and FPO roofing systems have the lowest Cumulative Energy Demand (CED) of all of the roofing systems compared.
- **Cradle to Grave:** highly reflective, mechanically fastened thermoplastic **Sarnafil®** membranes provide energy savings during the use phase. Furthermore, the roof build-up can be dismantled and recycled at the end-of-life.
- **Cradle to Grave:** Sika green roofing systems combine a relative low Cumulative Energy Demand (CED) from the raw material and production phase with additional benefits in the use phase, including reducing the energy consumption and the urban heat island effect.



Resource efficiency solutions

- Sika thermoplastic PVC and FPO membranes use fewer resources than competitive technologies – in fact replacing mass by technology, thereby providing much higher performance per mm of the waterproofing layer.
- **SikaRoof® MTC** liquid applied membranes provide a new life to existing roof structures and upon reaching the life term of MTC systems (with a simple recoating), therefore reducing the resource demand for refurbishment.



Climate protection solutions

- **Cradle to Gate:** the LCA's performed show that Sika thermoplastic PVC and FPO roofing systems have the lowest Global Warming Potential (GWP) of all of the roofing systems compared. This means a reduced Carbon Footprint for a solution that is here to last.
- **Cradle to Grave:** the best performance with regard to GWP is achieved by a high-quality Sika solution that has a superior service life. Fewer replacements of the roofing system being required over time means saving costs as well as reducing the Carbon Footprint of your building.
- **Cradle to Grave:** adding a Photovoltaic system to your roof may allow you to achieve a positive CO₂ balance within a few years.

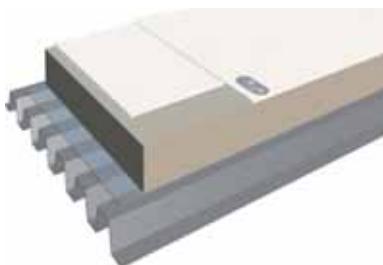


Air quality solutions

- **Cradle to Gate:** Sika provides roofing systems with a low POCP – notably Sika thermoplastic PVC and FPO mechanically fastened roofing systems as well as Sika thermoplastic PVC and FPO green roofing solutions.
- With regard to the on-site application phase, Sika has innovative VOC free and low VOC solutions. This means reducing the summer smog potential and improving the air quality.



Sika Sustainable Roofing Solutions



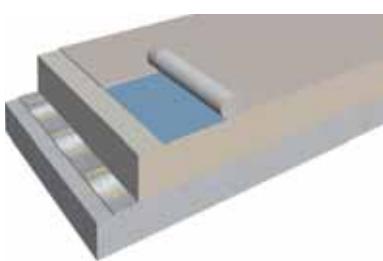
Sika thermoplastic PVC and FPO mechanically fastened roofing systems

- Low energy and resource demand from the raw material and production phase
- Very low GWP – low Carbon Footprint
- High reflectivity helps reducing cooling energy demand and can contribute to your Green Building Certification rating
- Superior durability means replacing fewer times and as a result saving costs, energy and CO₂
- Roof build-up is easy to dismantle at the end-of-life and therefore unproblematic to recycle



Sika green roofing systems

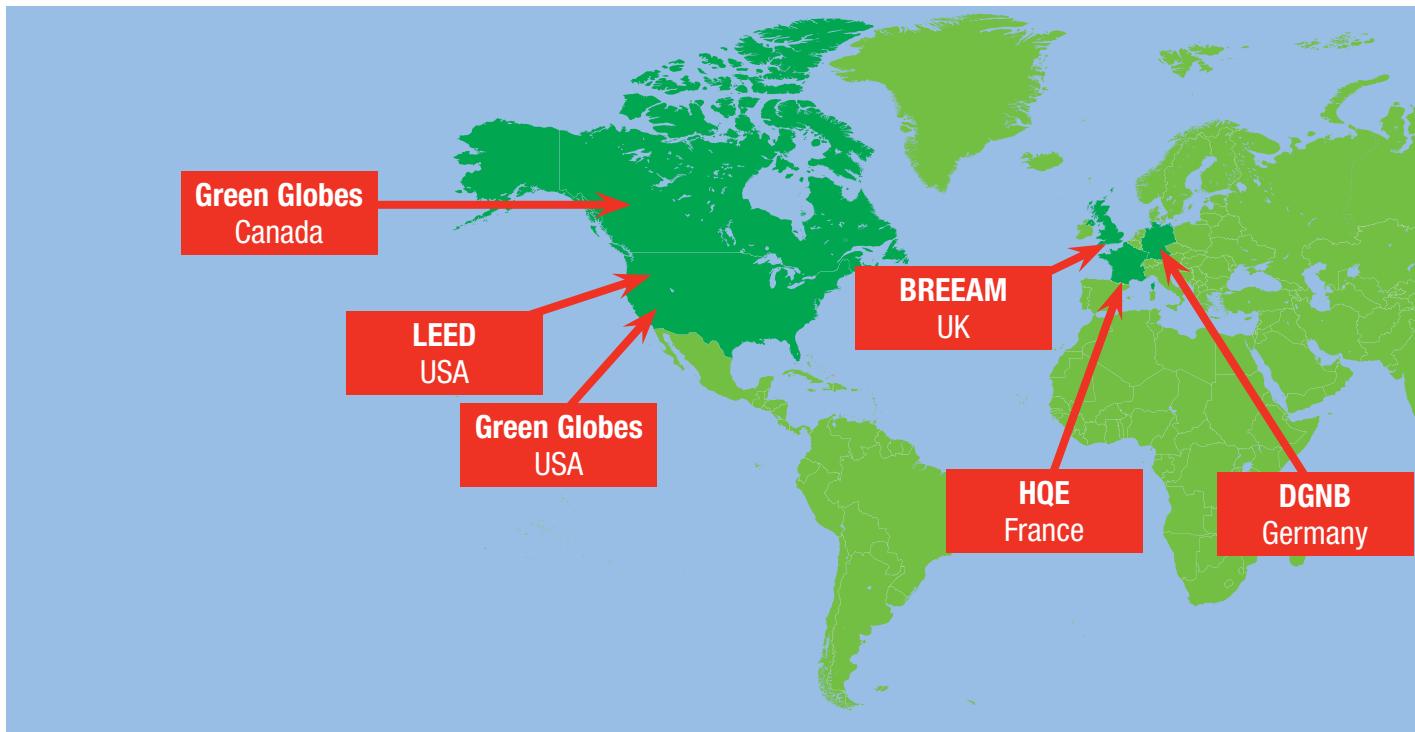
- Low energy and resource demand from the raw material and production phase
- Very low GWP – low Carbon Footprint
- Green roof build-up contributes to saving cooling energy, reduces the urban heat island effect and can contribute to your Green Building Certification rating
- Excellent durability means replacing fewer times and as a result saving costs, energy and CO₂



Sika thermoplastic PVC and FPO roofing systems using VOC free adhesives

- Low energy and resource demand from the raw material and production phase
- Low GWP – low Carbon Footprint
- High reflectivity helps reducing cooling energy demand and can contribute to your Green Building Certification rating
- Innovative, solvent free Sika adhesives result in a virtually VOC free roof build-up. This means reducing the summer smog potential and improving the air quality.
- No penetration of the roof deck
- High aesthetic appearance

Overview of Green Building Certification Programs



Over the recent years, several countries and organisations developed environmental certification programs for buildings. Practical experiences as well as new findings have been leading to adaptations and extensions of the programs.

The criteria of the programs are similar while the evaluation differs substantially. Most Green Building Certification Programs focus on assessing whole buildings rather than building products. However requirements for individual product categories are also included in several programs (e.g. VOC content, SRI Solar Reflectance Index). LCA allows to accurately characterize products and systems in terms of sustainability performance. For specific information regarding the various Certification Programs, please contact your local Sika organization.

LEED (Leadership in Energy and Environmental Design)

www.usgbc.org/LEED

LEED is the world's best known green building certification system. It was developed in 2000 by the USGBC (US Green Building Council) and is most relevant for North America, but is also used in many other regions around the world, such as South America, Europe and Asia. It is based on a set of rating systems where specific topics are assessed, such as transportation, recycling content, etc. The current LEED program is not LCA based.

How can Sika Roofing Systems contribute to your LEED certification?

Sika Sarnafil's EnergySmart Roof® membranes and Green Roof systems can contribute to multiple points in LEED's Sustainable Sites category. This is done by replacing natural landscape removed in the construction process with a green (vegetated) roof, controlling stormwater runoff and helping reduce the heat island effect.

- Credit 6.1 Stormwater Design – Quantity Control – 1 point
- Credit 7.2 Heat Island Effect – Roof – 1 point

For further details, please contact Sika US or visit

www.usa.sarnafil.sika.com

BREEAM (BRE Environmental Assessment Method)

www.breeam.org

BREEAM is an environmental assessment method and rating system for buildings, launched in 1990 by the British organisation BRE (Building Research Establishment). It is also used in other countries such as Netherlands and Spain. BREEAM assesses the overall performance of buildings using factors such as energy and water use, the internal environment (health and well-being), pollution, transport, materials etc., awarding credits in each area according to performance. The environmental impact is determined by using LCA.

How can Sika Roofing Systems contribute to your BREEAM certification?

Sika roofing systems achieve low "Ecopoint" scores and can provide excellent contributions towards BREEAM ratings, demonstrated by an A+ rating in the BRE Green Guide for Construction and Code for Sustainable Homes.

For further information, please contact Sika UK or visit

www.sika.co.uk

DGNB (Deutsches Gütesiegel für Nachhaltiges Bauen)

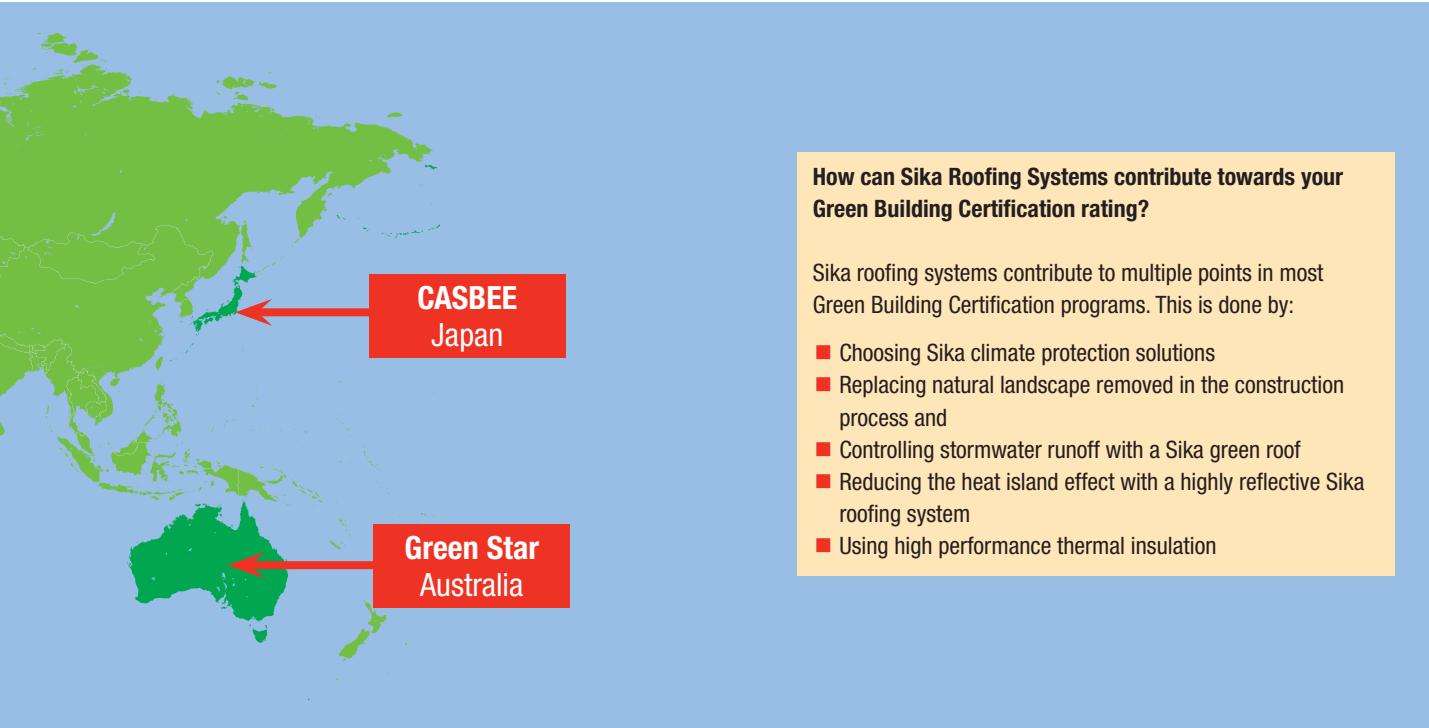
www.dgnb.de

The DGNB Certification System was developed by the German Sustainable Building Council (DGNB) and the German Government in 2009 and several country adaptations are under preparation. It is based on several criteria within 6 topics, among which are Ecological Quality, Economical Quality and Technical Quality. For the Ecological Quality topic, LCA data is required. As a basis for data communication, Environmental Product Declarations (EPD's) are used.

How can Sika Roofing Systems contribute to your DGNB certification?

Sika roofing systems were among the first roofing systems to be included in the DGNB Navigator (July 2011). EPD's are available. For further information, please contact Sika Germany or visit

www.sika.de



How can Sika Roofing Systems contribute towards your Green Building Certification rating?

Sika roofing systems contribute to multiple points in most Green Building Certification programs. This is done by:

- Choosing Sika climate protection solutions
- Replacing natural landscape removed in the construction process and
- Controlling stormwater runoff with a Sika green roof
- Reducing the heat island effect with a highly reflective Sika roofing system
- Using high performance thermal insulation

HQE (Haute Qualité Environnementale)

www.assohqe.org

The HQE is the French environmental quality management approach for construction, developed in 1994 and controlled by the Association for High Environmental Quality (ASSOHQE). The HQE certification is based on 14 target areas grouped in 4 themes: environmental construction, environmental management, comfort and health. The choice of construction products and materials is based on Environmental Product Declaration (EPD's) that include LCA data.

How can Sika Roofing Systems contribute to your HQE certification?

Sika green roofing systems as well as our highly durable roofing membranes contribute to the themes environmental construction & management. EPD's according to the French standard are available. For further details, please contact Sika France or visit

www.sika.fr

CASBEE (Comprehensive Assessment System for Building Environmental Efficiency)

www.ibec.or.jp/CASBEE/english

The CASBEE is the Japanese tool for assessing and rating the environmental performance of buildings. It was created in 2001 by the Japan Sustainable Building Consortium (JSBC) and measures the ratio between the Building Environmental Quality & Performance (e.g., thermal comfort) and the Building Environmental Loads (e.g. energy efficiency, global warming). LCA is used to determine quantitative assessment indicators for typical building environmental loads.

How can Sika Roofing Systems contribute to your CASBEE rating?

Sika green roof systems, highly reflective roofing membranes and high performance thermal insulation contribute to the CASBEE rating. For further details, please contact Sika Japan or visit

www.jpn.sika.com

Green Globes

www.openglobes.com

The Green Globes system is based on BREEAM and was created in 1996. It is used in Canada, operated by the Building Owners and Managers Association of Canada (BOMA) and Energy and Environment Canada Ltd. (ECD), and in the USA, where it is operated by the Green Building Initiative (GBI). In the Green Globes system for the Design of New Buildings, points are given in the resource section for conducting a LCA of building assemblies and materials.

How can Sika Roofing Systems contribute to your Green Globes rating?

Sika roofing systems can contribute to multiple points in the sections Site, Energy, Resource/Materials and Indoor Environment.

For further details, please contact Sika Sarnafil US or visit

www.usa.sarnafil.sika.com

Green Star

www.gbca.org.au/green-star

The Green Star environmental rating system of buildings was developed in 2003 by the Green Building Council of Australia (GBCA), based on LEED and BREEAM. It is leading in Australia, South Africa and New Zealand. Green Star assesses a project's environmental performance against nine environmental impact categories. It encourages the use of materials that fulfil its environmental best practise, but does not have a real inclusion of LCA.

How can Sika Roofing Systems contribute to your Green Star rating?

Sika Climate Protection Solutions, green roof systems and high performance thermal insulation can contribute to your Green Star rating.

For further details, please contact Sika Australia or visit

www.sika.com.au

How Can I Contribute to Sustainable Construction?

Sika Technology and Concepts for Roofing

Innovation & Consistency since 1910

Roofing Thermal Insulation Overview

Innovation & Consistency since 1910

Sika Solutions for Construction

Innovation & Consistency since 1910

Sika provides a full range of solutions from Basement to Roof. Please request further information from your local Sika organization.

You Can Contribute to Sustainable Construction by:

- Choosing roofing systems that use less energy and resources
- Selecting roofing systems with a low Global Warming Potential (GWP) – reducing the carbon footprint of your building
- Investing into highly durable roofing systems that have stood the test of time – saving energy and resources as well as cost over the life time of a building
- Selecting a roofing system that is recycled at the end of its service life

Further Information on Sustainability



The link opens the Sika Corporate Sustainability webpage. It provides you access to information on Sika sustainability partnerships and initiatives, environment & safety and much more.

www.sika.com/en/group/sustainability.html

Sika Services AG

Business Unit Contractors
Industriestrasse 26
6060 Sarnen / Switzerland
Phone +41 58 436 79 66
Fax +41 58 436 76 60
www.sika.com

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