Sustainability in Flooring

Sika Solutions – Proven Competence
“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?

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 best way to evaluate the sustainability of products and systems.

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

- **Goal and scope definition**: Defining the product system, functional unit, system boundaries, agreed assumptions and impact assessment methodology.
- **Inventory analysis**: Collection of the data required to quantify these relevant inputs and outputs of the product system.
- **Impact assessment**: Association of inventory data with impact categories.
- **Interpretation**: Further analysis and evaluation of the results.

**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 draft 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 (CO₂), 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 (NOx). It is common in large cities, where high amounts of VOC and NOx are released (e.g., industrial and automotive emissions), especially during summer when there is more sunlight. Summer Smog can be particularly 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, groundwater, 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 (SO₂), into acids, which have a wide variety of impacts (e.g., in the 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, other 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 material resources.

**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 CO₂-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 draft 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?

- Natural resources
- Raw materials
- Production
- Application
- Use and maintenance
- End-of-life

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.
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 project value chain.

**Resource efficiency solutions**
Sika products and systems which contribute to reducing the resource demand over the entire project value chain.

**Climate protection solutions**
Sika products and systems which contribute to reducing the carbon emissions over the entire project value chain.

**Water efficiency solutions**
Sika products and systems which contribute to reducing the water demand over the entire project 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 project value chain.

The Sika Contribution to Sustainable Construction

How can 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.
The Sika Life Cycle Approach for Flooring Systems

Flooring Systems – The Sika Life Cycle Approach

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

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

Which life cycle phases are most relevant for flooring?

From a Cradle to Gate perspective, the majority of the potential impacts are connected to the raw materials (A), which are used to produce the products (B), that are used to build up the flooring systems; including primers, wearing coats and sealers.

From a Cradle to Grave perspective, beside the raw materials, the ‘Use’ phase (D) and the End-of-Life phase (E) have the most significant influence on the overall sustainability performance of flooring systems. This is due to the different future maintenance and refurbishment requirements of different flooring systems, which are highly dependent on the intended use, exposure and durability of the floor.

What is included in the Sika flooring LCA?

The LCA data in this brochure refers to 1 m² of the flooring system and is either based on a Cradle to Gate or a Cradle to Grave approach 1.

Who performed and reviewed the Sika flooring LCA?

The Sika flooring LCA’s have been performed internally by the Sika Corporate Product Sustainability Group, using the ‘state-of-the-art’ GaBi software from PE International. These have then been reviewed by the leading Swiss research institute, the Swiss Federal Laboratories for Materials Science and Technology (EMPA).

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1 In the LCA’s, neither the subfloor construction (concrete deck) nor capital goods (e.g. machinery) were considered, as these are additional variables and apart from the actual flooring system.
How Can Sika Flooring Systems Contribute to Sustainable Construction?

**Energy and resource efficient flooring systems:** Sika provides flooring systems that use less energy and resources by comparison with other technologies and systems.

**Climate protection flooring solutions:** Sika provides flooring systems with a low Global Warming Potential. This means a reduced carbon footprint.

**Air quality flooring solutions:** Sika provides low Volatile Organic Compound (VOC) and VOC-Free flooring solutions, which help to avoid summer smog and which improves health and safety conditions during the floor installation process.

**Air quality:** Sika provides Low Emission flooring solutions, which fulfill all of the demanding requirements for Indoor Air quality in both Public and Private Buildings. Specific Sika flooring solutions are also produced for Clean Room facilities that have the lowest levels of emissions possible.

**Maintenance:** Sika seamless flooring systems allow better and easier cleaning over time when compared to other flooring materials with grouted joints or with welds.

**Refurbishment:** Sika flooring systems can easily be refurbished to extend their service life, thereby reducing costs, energy and resources compared with other flooring technologies.

**End-of-life:** High performance Sika flooring solutions provide comparatively thin flooring systems, which means that there is less material to be disposed of at the end of life.
**Descriptions of Sika Flooring Systems Covered in the LCA’s**

**For General Manufacturing Industry**

**System**

**Design / Build-up**

**Sikaﬂoor®-264 Smooth**

2 x Sikaﬂoor®-264
A total solids, cost effective, coloured high build coating based on epoxy resin.
Total layer thickness: 0.6 – 0.8 mm

**Sikaﬂoor®-161/-264 Antislip**

Primer: Sikaﬂoor®-161
Coating: Sikaﬂoor®-264 Broadcast
A two part, total solids, coloured, epoxy binder for textured coating systems.
Total layer thickness: 0.6 – 0.8 mm

**Sikaﬂoor®-263 Antislip**

Primer: Sikaﬂoor®-161
Base coat: Sikaﬂoor®-263 + Filler
A two part, total solids, coloured, epoxy binder for broadcast systems (with quartz sand).
Seal coat Sikaﬂoor®-264
Total layer thickness: 2 – 4 mm

**System**

**Design / Build-up**

**Sikaﬂoor®-326 Smooth**

Wearing course: Sikaﬂoor®-326 + Filler
A total solids coloured polyurethane binder for elasto-plastic thermal shock absorbing, self smoothing screeds.
Total layer thickness: 2 mm

**Sikaﬂoor®-24 PurCem®**

Primer: Sikaﬂoor®-161
Wearing course: Sikaﬂoor®-24 PurCem®
Self-leveling, heavy duty, 3 – 4 part modified PU screed
Total layer thickness: 2 – 4 mm
For Food Industry: Production and Processing Areas

**Design / Build-up**

**Dry Area**

Primer: **Sikafloor®-161**
Base coat: **Sikafloor®-263** + Filler
A two part, total solids, coloured, epoxy binder for broadcast systems (with quartz sand).
Seal coat **Sikafloor®-264**
Total layer thickness: 2 – 4 m

**System**

**Dry and Wet Areas**

Primer: **Sikafloor®-161**
broadcast with quartz sand
Wearing course: **Sikafloor®-20 PurCem®**
Easy trowel grade, heavy duty, 3 – 4 part modified PU screed.
Total layer thickness: 6 mm

**System**

**Dry Area**

Primer: **Sikafloor®-161**
broadcast with quartz sand
Wearing course: **Sikafloor®-21 PurCem®**
Self-levelling, heavy duty, 3 – 4 part modified PU screed
Total layer thickness: 4.5 mm

**System**

**Heavy duty ceramic tile**

Adhesive: Cement based
Ceramic tiles, 10 x 15 cm,
Thickness 20 mm
Jointing: epoxy mortar
Total layer thickness: 22 mm
## Descriptions of Sika Flooring Systems Covered in the LCA’s

### For Pharmaceutical Industry: Production and Processing Areas

<table>
<thead>
<tr>
<th>Design / Build-up</th>
<th>System</th>
<th>Design / Build-up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sikaflor®-269 CR</strong></td>
<td>Smooth for Clean Room</td>
<td><strong>Sikaflor®-263 SL</strong></td>
</tr>
<tr>
<td>Primer: <strong>Sikaflor®-161</strong></td>
<td>Wearing course: <strong>Sikaflor®-269 CR</strong> + Filler</td>
<td>Primer: <strong>Sikaflor®-161</strong></td>
</tr>
<tr>
<td>Wearing course: <strong>Sikaflor®-269 CR</strong> + Filler</td>
<td>A two part, total solid, low-emissions, coloured, epoxy binder for self-smoothing screed systems. Total layer thickness: 2 – 3 mm</td>
<td>Wearing course: <strong>Sikaflor®-263 SL</strong> + Filler</td>
</tr>
<tr>
<td><strong>Sikaflor®-269 ECF CR</strong></td>
<td>Smooth for Clean Room</td>
<td><strong>Sikaflor®-263 SL</strong></td>
</tr>
<tr>
<td>Primer: <strong>Sikaflor®-161</strong></td>
<td>Conductive layer: <strong>Sikaflor®-220 W</strong></td>
<td>Primer: <strong>Sikaflor®-161</strong></td>
</tr>
<tr>
<td>Conductive</td>
<td>Wearing course: <strong>Sikaflor®-269 ECF CR</strong> + Filler</td>
<td>Base coat: <strong>Sikaflor®-263 SL</strong> + Filler</td>
</tr>
<tr>
<td>A two part, total solids, electrostatic conductive, low-emissions, coloured, epoxy binder for self-smoothing screed systems. Total layer thickness: ca. 2 mm</td>
<td>A two part, total solids, coloured, epoxy binder for self-smoothing screed systems. Total layer thickness: 2 – 3 mm</td>
<td>A two part, total solids, coloured, epoxy binder for broadcast systems (with Sika PU Coloured Quartz). First sealer coat: <strong>Sikaflor®-169</strong></td>
</tr>
<tr>
<td><strong>Safety PVC (EN 13845)</strong></td>
<td></td>
<td>Second sealer coat: <strong>Sikaflor®-169</strong></td>
</tr>
<tr>
<td>Damp proof membrane: epoxy primer</td>
<td></td>
<td>Total layer thickness: 2 – 3 m</td>
</tr>
<tr>
<td>Underlayment: cementitious compound 3 mm</td>
<td></td>
<td><strong>Antiskid</strong></td>
</tr>
<tr>
<td>Adhesive: acrylic binder</td>
<td></td>
<td>Primer: <strong>Sikaflor®-161</strong></td>
</tr>
<tr>
<td>Floor covering: Safety PVC (EN 13845)</td>
<td></td>
<td>Base coat: <strong>Sikaflor®-263 SL</strong> + Filler</td>
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<tr>
<td>Total layer thickness: 4 – 5 mm</td>
<td></td>
<td>A two part, total solids, coloured, epoxy binder for broadcast systems (with Sika PU Coloured Quartz). First sealer coat: <strong>Sikaflor®-169</strong></td>
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<tr>
<td></td>
<td></td>
<td>Second sealer coat: <strong>Sikaflor®-169</strong></td>
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<tr>
<td></td>
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<td>Total layer thickness: 2 – 3 m</td>
</tr>
</tbody>
</table>
For Car Park Decks

**Design / Build-up**

**Intermediate Decks**

- **Sikaflor®-263 Antislip**
  - Primer: Sikaflor®-161
  - Base coat: Sikaflor®-263 SL
  - A two part, total solids, coloured, epoxy binder for self-smoothing screed systems (with quartz sand).
  - Seal coat: Sikaflor®-264
  - Total layer thickness: 2 – 4 mm

- **Sikaflor®-326 Antislip**
  - Primer: Sikaflor®-161
  - Base coat: Sikaflor®-326
  - Broadcast: Quartz sand
  - Seal coat: Sikaflor®-326
  - A total solids, coloured, elastomeric, protective waterproofing and wearing surface system for car park decks.
  - Total system thickness: 2.5 mm

**Intermediates and Top Decks**

- **Sikaflor®-OS11b**
  - Primer: Sikaflor®-161
  - Wearing course: Sikaflor®-350 N Elastic
  - Broadcast: Quartz sand
  - Seal coat: Sikaflor®-359 N + Filler
  - A total solids, elastomeric, protective waterproofing and wearing surface system for car park decks.
  - Total system thickness: 3 – 4 mm
  - One layer of bitumen sheet
  - Two layer of 30 mm bitumen asphalt
  - Total system thickness: ca. 63 mm

**Asphalt system (2 x 30)**

For Commercial and Public Buildings

**Design / Build-up**

**Sika ComfortFloor® System**

- **Primer:** Sikaflor®-144/-161
- **Base coat:** Sikaflor®-330
- **Sealer:** Sikaflor®-305 W
- **Total system thickness:** 2 – 3 mm

**Terrazzo**

- **Primer:** Epoxy
- **Mortar:** Epoxy binder 15% + Marble aggregate
- **Grouting and pore filler:** Epoxy
- **Top sealer:** Water based PU
- **Total layer thickness:** 8 – 10 mm

**Heterogeneous PVC**

- **Underlayment:** cementitious levelling compound 3 mm
- **Adhesive:** acrylic binder
- **Floor covering:** Heterogeneous PVC (EN 649)
- **Total layer thickness:** 4 – 5 mm

**Linoleum**

- **Underlayment:** cementitious levelling compound 3 mm
- **Adhesive:** acrylic binder
- **Floor covering:** Linoleum (EN 548)
- **Total layer thickness:** 4 – 5 mm
LCA Results for Cumulative Energy Demand (CED)

The Challenge:
The demand for limited natural resources is increasing.

Worldwide the demand for limited natural 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 natural resources is one of the main challenges for future growth.

LCA Results for Popular Flooring Systems

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

You can contribute to saving energy and natural resources by choosing Sika flooring solutions that:
- have the lowest CED of all of the flooring systems compared (Energy & resource efficiency solutions)
- include a wide range of cost effective sustainable flooring systems to match your requirements
The Challenge: The climate is changing faster than ever before. The earth’s climate is now 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 Flooring Systems

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

You can contribute to protecting our climate by choosing Sika flooring solutions that:
- have a lower GWP when compared with most of the flooring systems compared (Climate protection solutions)
- include a wide range of cost effective sustainable flooring systems to match your requirements
- provide superior durability, together with additional benefits in the ‘Use’ phase
LCA Results for Photochemical Ozone Creation Potential (POCP)

The 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 (NOx). It is common in large cities, where high amounts of VOC and NOx are released (e.g., industrial and automotive emissions), especially during summer when there is more sunlight. Summer Smog may be harmful to human health and ecosystems. The well-being of people and ecosystems needs to be ensured.

LCA Results for Popular Flooring Systems

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

Note: Materials for repairs are included where they are required to provide the defined life expectancy (Sikaflor®-263 Antislip)

You can contribute to reducing the Summer Smog by choosing Sika flooring solutions that:
- have the lowest POCP of all of the flooring systems compared (Air quality solutions)
- use VOC free or Low VOC products (e.g. Sikaflor® PurCem®, Sikaflor®-269 CR, Sikaflor®-326)
Conclusions from the LCA Results

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

Energy efficiency solutions

The Sikaflor® systems have a lower Cumulative Energy Demand (CED) than other flooring technologies, for instance:
- For Public Buildings: Sika® ComfortFloor® systems
- For the Food Industry: Sikaflor® PurCem® systems
- For Car Park Decks: Liquid applied Sikaflor® systems

You can contribute to saving energy by choosing these high performance and low environmental impact Sika flooring systems.

Resource efficiency solutions

- The Sikaflor® solutions for Car Park Decks provide the lowest demand solution in terms of resources, when compared to the traditional thicker deck waterproofing and wearing surface solutions on the market.
- Sikaflor® PurCem® technology provides the optimum solution for high performance in the food industry and many other demanding chemical and heavy mechanical industries.

Climate protection solution

Sika flooring systems have a lower Global Warming Potential (GWP) compared to other flooring technologies, for instance:
- For Public Buildings: Sika® ComfortFloor® systems
- For the Food Industry: Sikaflor® PurCem® systems
- For General Manufacturing Industries: Sikaflor®-263 and 264 systems

Air quality solution

In all markets and applications, Sikaflor® solutions have the lowest Photochemical Ozone Creation Potential than the other flooring technologies available.

You can contribute to preventing Summer Smog by choosing these high performance and low environmental impact Sika flooring systems.
Sika® ComfortFloor® Systems as Sustainable Alternatives

Sika® ComfortFloor® systems provide a wide range of solutions that can meet all of your technical requirements. Furthermore the LCA’s show that Sika® ComfortFloor® systems are also a good investment in the long run, due to their ease of maintenance without the need to completely reinstall a new flooring system. Sika® ComfortFloor® systems do not require any cementitious underlayments nor additional adhesives, they are fully monolithic with the concrete or screed of the building structure.

Global Warming Potential (GWP) [kg CO₂-eq./m²] – Lifespan 20 years

Case study: the Flevomeer Library in the city of Leylstad (The Netherlands) had to be refurbished and upgraded. The choice of a Sika® ComfortFloor® produced an excellent technical and aesthetic solution with a seamless surface that is fully bonded to the substrate. The Sika® ComfortFloor® carbon footprint is lower than competitive solutions that can also require a damp proof membrane, plus additional levelling compounds and adhesives. The Sika® ComfortFloor® systems also eliminate the need for welding.

End-of-Life scenario: Sika® ComfortFloor® systems go to landfill at end-of-life, the same as the levelling and adhesive residues from Linoleum and PVC sheets and Terrazzo Systems. The Linoleum and PVC sheets themselves go 20% to landfill and 80% to incineration at their end-of-life (reference: ERFMI).
Investing in Sustainable Food Industry Floor

Heavy Duty Solutions for the Highest Requirements

The Food and Beverage Industries are amongst the most demanding in terms of the mechanical performance of the floors, plus they require extreme high and low temperature performance with resistance to thermal shock. The durability of a flooring system is a key driver for the performance of a manufacturing plant. Sikaflor® PurCem® solution have been successfully installed around the world for decades and continue to give high performance and seamless surfaces, providing an advantageous solution without any joints that could be the source of degradation or hygiene risks.

Sikaflor® PurCem® is selected because it is a seamless flooring solution which makes it much easier to clean than any solution with joints, plus it is a Solvent Free solution that allows application close to on-going production process areas, enabling the repair and renovation of existing floors without shutting down the plant or production lines. In addition Sikaflor® PurCem® is an AgBB approved system due to the system’s very low VOC emissions in accordance with ISO standards.

End-of-life scenario: landfill disposal for all systems at end of life. However with tiled floors, there is also an additional 10% volume due to the bedding and jointing material.
Reduce the Energy Demand of Your Car Parking Areas

High Performance from a Lower Weight

Sika solutions for Car park decks prevent or accommodate all of the various stresses and exposures including thermal variations, atmospheric carbonation, de-icing salts, traffic impact and abrasion, plus deck movement, together with the waterproofing requirements. These solutions with thicknesses of up to only 5 mm of the liquid applied Sikafloor® products, can provide the equivalent performance of traditional solutions, such as asphalt, with a much lower thickness. This means much lower quantities of natural resources and more efficient dimensioning.

Cumulative Energy Demand (CED) [MJ/m²] – Lifespan 15 years

<table>
<thead>
<tr>
<th>Material</th>
<th>2 mm</th>
<th>2.5 mm</th>
<th>3.5 mm</th>
<th>63.5 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sikafloor 263 Antislip</td>
<td>2 mm</td>
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<tr>
<td>Sikafloor 326 Antislip</td>
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</tr>
<tr>
<td>Sikafloor OS 11b</td>
<td>3.5 mm</td>
<td></td>
<td></td>
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<tr>
<td>Asphalt</td>
<td>63.5 mm</td>
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Remarks:
- Assumption for Car Park Application: no maintenance

Case study: given a choice, people always prefer to park in light and bright car parks where they feel that themselves, their car and its contents, will all be safe and secure. Sika’s car park decking systems can be designed in any colour scheme. For example at Zurich Airport, in addition to the much wider choice of colours for design from the Sikafloor® systems, the equivalent black asphalt system’s weight was above 150 kg/m². This compared to the Sikafloor® systems being between 5 and 9 kg/m² – This much lower weight has a much lower impact on natural resources.

End-of-life scenario: Landfill disposal for the Sikafloor systems, with up to 75% of the asphalt also going to Landfill. Assumption for Car Park Decks: no maintenance
Optimise the Carbon Footprint of Your Industrial Floors

Manufacturing industries have many different operational criteria for floors that may be classified as being resistant to: mechanical exposure, chemical exposure, thermal exposure; providing slip resistance, aesthetics, surface texture and comfort underfoot. A basic comparison from a sustainability point of view between Sikafloor® solutions shows that the life expectancy of the systems can also become a critical decision factor. The Sikafloor® PurCem® technology will provide the best solution for a long term investment.

Global Warming Potential (GWP) [kg CO₂-eq./m²] – Lifespan 15 years

Case study: the selection of the right Sikafloor® system is based on an analysis of all of the requirements for the floor: the mechanical and chemical resistance requirements are the most common factors that guide the right selection. Additional criteria can include temperature resistance, electrostatic performance and slip resistance, etc. The Sikafloor® PurCem® systems provide the toughest solutions whilst also having an excellent low carbon footprint, particularly in relation to their life expectancy and the thickness installed.

End-of-life scenario: Landfill
**Extend Your Service-Life with Sikafloor®**

**Regeneration of Sikafloor® Solutions**

Sikafloor® solutions have been used for many years in many different industries where high traffic, severe abrasion, impact and shock are daily stresses on the floor. Different techniques are available to regenerate Sikafloor® systems and extend the service-life of the whole floor. These techniques are:

- Resurfacing with a thin top coating compatible with the original system. This solution provides a brand new surface with the added option of changing the colour.
- Refurbishment with diamond grinding pads: This technique is only possible with a thicker layer and smooth floor. The result is a regenerated floor with the removal of existing surface damage and the floor retains its original colour.

**Global Warming Potential (GWP) [kg CO₂-eq./m²]**

![Graph showing Global Warming Potential (GWP) for different recoating methods.]

**Case study:** an epoxy based Sikafloor® self-levelling system was applied in 2004 at a chemical plant in Stuttgart, Germany. The continuous activity of the work area prevented any cleaning of the floor. In 2011, regeneration of the floor surface was made using Diamond Grinding Pads, without detergents. As a result, the original Sikafloor® system was restored to the same glossy surface as a new system. A thin coating of Sikafloor®-305W would have given limited improvement, alternatively again a new layer of Sikafloor®-264 would have been the solution of choice if aesthetics were the most important criteria.
Volatile Organic Compounds in Flooring

Sika and Responsibility for Health and the Environment

What are VOC’s
VOC is the standard abbreviation for ‘Volatile Organic Compound’, a chemical with a significant vapour pressure. VOC’s can frequently have a potential long term health impact and may also have an adverse effect on the environment. Sika takes action and continuous development to minimise the VOC content in Sikaflor® systems.

VOC content
Legal regulations are used when setting the limit values of VOC content in products for reducing total emissions during the life-cycle of a product, and for minimizing any contribution to the generation of ground level ozone. Limit values are usually applied to paints, coatings, varnishes, adhesives and sealants. Regulations include:

- US Classifications (i.e. SCAQMD)
- German Standards (TRGS 613)

The VOC content is measured in the liquid material as supplied and is usually given as grams of VOC per litre of product. For example, the European Directive limits the VOC content to a maximum of 500g/l for several categories.

The quantity of defined VOC in the formulation of a flooring system is therefore another important selection criteria for many ‘Green’ building councils programmes around the world, such as LEED in the USA and Green Star in Australia.

All Sikaflor® systems are developed in order to comply with the respective limits and typically to exceed the different local requirements. Additionally the European “Decopaint” Directive (2004/42/EC) is also limiting the total content of VOC’s in Sikaflor® systems in order to reduce the generation of ground level ozone.
Indoor Air Quality Around the World

Initiatives for Indoor Air Quality

VOC emission
Almost any materials can emit VOC’s, a very well-known example is the VOC emission of resinous woods that consist mainly of aldehydes and terpenes, which also result in the classic wood odour. In order to provide a healthy environment and good indoor air quality, the VOC emissions of construction materials are strictly controlled. The limits are given as milligrams of VOC’s per m² and for example the German scheme AgBB, limits the total VOC emissions of a flooring system to less than 1 mg/m².

Controlling the quality of Indoor Air has recently become a more major concern, as modern energy efficient buildings are characterised by increased insulation and reduced ventilation. Both of these measures combine to result in a decreased air exchange rate. Modern low emission construction materials are therefore required in order to obtain the appropriate indoor air quality. Some Governments have already introduced measures to limit and reduce emissions from many building materials. Other voluntary initiatives are also now widely offered on the global market.

All Green Building Certification Programmes (i.e. LEED, BREAM, HQE, DGNB, ... see page 30) now include Indoor Air Quality as a parameter for excellence in new building construction.

<table>
<thead>
<tr>
<th>Governmental initiative to reduce VOC emission *</th>
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<tbody>
<tr>
<td>Germany</td>
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<tr>
<td>France</td>
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<tr>
<td>EU</td>
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<tr>
<td>US</td>
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<tr>
<td>Japan</td>
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* Usually health and environment driven Governments and their agencies

<table>
<thead>
<tr>
<th>Voluntary initiatives from Manufacturers Associations and other agencies</th>
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<tbody>
<tr>
<td>Europe</td>
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<tr>
<td>Emicode for adhesive</td>
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<tr>
<td>i.e. Sikabond® (Germany) *</td>
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<tr>
<td>GUT (Germany) *</td>
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<tr>
<td>AFSSET (France)</td>
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<tr>
<td>M1 (Finland)</td>
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<tr>
<td>Blue Angel (Germany) *</td>
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</tbody>
</table>

* not relevant for Sikafloor® products

Many Sikafloor® systems and products are fully tested and approved according to these different initiatives including: AgBB in Germany, Mandatory labelling in France, plus the Japanese Ministry guidelines. Please contact your local Sika Technical Services Department for the relevant emission certificates. In addition Sikafloor® systems based on epoxy resins and polyurethane resins do not contain any formaldehyde and in many cases meet the highest standards in terms of Very Low Emission flooring solutions.
Helping the Indoor Air Quality of Public Buildings

Sika® ComfortFloor® Systems Respect the Air

The formulation of Sika® ComfortFloor® systems takes care of all VOC emissions during their service life time:
- Sika® ComfortFloor® systems are solvent-free in accordance with the standards of Deutsche Bauchemie (the German Manufacturers Association). They are therefore also largely below the legal limits of VOC emissions in the European Directive, Decopaint. This ensures a safer environment for producing and installing the flooring systems.
- Sika® ComfortFloor® systems have been evaluated for potential emissions, including initial emissions just after installation, early emissions during the first weeks, or emissions during the in-use phase, which is generally measured 28 days after installation. Sika® ComfortFloor® systems therefore comply with all of the local and national requirements such as AgBB in Germany, AFSSET in France, and M1 Emissions in Finland.

The different Sika® ComfortFloor® systems passed the highly demanding emission tests to AgBB that follow the latest German requirements and limitations.

These systems:
- Sika® ComfortFloor®
- Sika® ComfortFloor® Pro
- Sika® ComfortFloor® Decorative
- Sika® ComfortFloor® Decorative Pro

are also certified to many other requirements including the French AFSSETT and the American California Department of Health Services 01350.

<table>
<thead>
<tr>
<th>AgBB certification</th>
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<tr>
<td>Requirements – limit emissions on samples stored in the test chamber for 3 &amp; 28 days</td>
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<table>
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<tr>
<th>3 days test representative of building renovation with early reoccupancy</th>
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<tr>
<td>- Prohibits high initial VOC emissions</td>
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<tr>
<td>- Absence of Carcinogens</td>
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</table>

<table>
<thead>
<tr>
<th>28 days test representative of long term emissions</th>
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<tbody>
<tr>
<td>- Total volatile and semi volatile organic</td>
</tr>
<tr>
<td>- Compounds (TVOC, SVOC) at 28 days</td>
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<tr>
<td>- Absence of carcinogens</td>
</tr>
</tbody>
</table>

Sika® ComfortFloor® systems are AgBB approved

Case study: most people spent more than 80% of their time in an indoor environment including: in their home, office, factory, in transport hubs such as airports, or in schools and hospitals etc. Therefore many people are now concerned about the Indoor Air Quality in Public Buildings. When the choice of flooring for an indoor space is of such importance, Sika® ComfortFloor® is the first choice for a flooring solution; as it is approved by AgBB, which is one of the most stringent initiatives in terms of Indoor Air Quality today.
Sika Expertise in Low Emission Construction Products

Low Emission Sikafloor® Systems Are Available Globally

For the development of Low VOC and Ultra Low VOC emission flooring systems, Sika invested in an Emissions Technology Centre within the Corporate Analytical Services section of our Research and Development Department. This is equipped to make emissions measurements using the latest techniques and equipment, including many different types of test chambers. The Emissions Technology Centre is familiar with all of the main VOC assessment schemes and is also able to adapt or develop emissions measurement according to our customer’s needs. All Sikafloor® systems have therefore been fully tested regarding their emission rates and these are continuously observed and monitored.

Principles of emission testing

Measuring VOC emissions is commonly undertaken using the chamber method. This method has 4 steps:

- Preparation of the Sample
- Position the sample in a ventilated Test chamber
- Collection of the VOC’s in a specific tube
- Analysis and measurement of the type and quantity of the VOC’s
- Assessment of the results according to the respective scheme. The product can then be classified

Different test methods around the world

<table>
<thead>
<tr>
<th>Standard</th>
<th>Tests</th>
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<tbody>
<tr>
<td>ISO 16000 *</td>
<td>Part 3: Aldehydes</td>
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<tr>
<td></td>
<td>Part 6: VOC and TVOC (Total VOC’s)</td>
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<tr>
<td></td>
<td>Part 9: The chamber test</td>
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<td></td>
<td>Part 10: The FLEC test</td>
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<tr>
<td></td>
<td>Part 11: Test specimen</td>
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<tr>
<td></td>
<td>Part 25: Micro chamber method</td>
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<tr>
<td>New CEN standard for CE marking</td>
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<tr>
<td>EN 717-1 for Formaldehydes *</td>
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<tr>
<td>US California, CA section 01350 *</td>
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<tr>
<td>Japanese JIS A 1901 *</td>
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</table>

* chamber test method

Sikafloor® solutions for Low VOC and Ultra Low VOC emissions have all been tested in the Emissions Technology Centre prior to their introduction on the market. However, the Standards and regulations are continuously evolving, so please contact your local Sika Technical Services Department for the latest VOC emission test certificates for Sikafloor® systems.
Low Emission Systems for Cleanrooms

Protecting Critical Cleanroom Environments

In recent years Sika has developed advanced new flooring, walling and joint sealing solutions specifically for cleanroom environments. Manufacturing under cleanroom conditions is becoming increasingly widespread and ever more demanding with regards to VOC emissions, plus limiting AMC’s (Airborne Molecular Contaminants) and Particle emissions. These seamless Sikafloor solutions do not require welding or adhesives, which also results in a limited number of constituents. As a consequence, the Sikafloor® Clean Room Systems also limit the number of possible sources for emissions and particles.

The latest list of Sika Cleanroom Suitable systems and products is available at [http://tested-device.com/](http://tested-device.com/) and at the date of publication these also include wall coating solutions: Sikafloor®-269 CR wall coating, Sikagard® Wall Coat N and the joint sealant Sikaflex® PRO-3 (using Sika’s i-cure technology).

![Cumulative Energy Demand (CED) MJ/m²](image)

**Case study: Sikafloor®-269 CR** is designed for high tech cleanroom environments. It has the lowest classification for emission of VOC’s and can also be used in environments where Airborne Molecular Contamination (AMC) is a critical selection factor for the flooring system. In comparison with Safety PVC vinyl sheet flooring (to EN 13845), this Sikafloor® system does not require any adhesive or levelling compound. The Cumulative Energy Demand CED of the Sikafloor®-269 CR is therefore considerably reduced by comparison.
Sika Flooring Solutions Contribute to a Sustainable Future

Sika Sustainable Flooring Solutions

Air quality solutions
- **Cradle to Gate**: Sika provides flooring solutions with a low POC for all types of manufacturing industry.
- **Application**: Sika VOC free solutions reduce the potential for Summer Smog and improve the air quality.
- **During the ‘Use’ phase**: Sika® ComfortFloor® systems are classified by the most demanding International Standards as Very Low emission flooring solutions.
- **During the ‘Use’ phase**: Sikafl oor®-269 CR cleanroom flooring has Very Low Emissions, Airborne Molecular Contamination and Particles emissions.

Energy efficiency solutions
- **Cradle to Gate**: Food Industry solutions: Life Cycle Assessments show that Sikafl oor® PurCem® systems have the lowest Cumulative Energy Demand (CED) of all flooring solutions for the food industry.
- **Cradle to Gate**: Car Park Decks: Life Cycle Assessments show that Sikafl oor® systems have far lower Cumulative Energy Demand (CED) than traditional solutions.
- **Cradle to Grave**: Cleanrooms: Sikafl oor®-269 CR has lower Cumulative Energy Demand than other systems, because the system does not require levelling compounds, adhesives or an additional damp proof membrane.

Natural resource efficiency solutions
- **Natural resource efficiency in LCA's is reflected in the Cumulative Energy Demand (CED)**. As a consequence, the same Sika Flooring solutions as presented above under Energy Efficiency Solutions are again the top performers.
- **Sikafl oor® car park deck solutions** provide high performance with much less material and lower weight imposed on the structure.

Climate protection solutions
- **Cradle to Gate**: LCA’s show that Sikafl oor®-269 has the lowest Global Warming Potential compared to sheet vinyl systems that require levelling compounds and adhesives.
- **Cradle to Gate in the Food Industry**: The best GWP is achieved with Sikafl oor® PurCem® systems.
- **Cradle to Grave**: Sika® ComfortFloor® systems have a lower Carbon Foot Print at the end of their Service Life, as alternative materials require more frequent replacement, rather than simple maintenance and recoating, plus they require additional accessories and products for levelling and bonding them to the substrate.
Sika Sustainable Flooring Solutions

**Sikaflor® car park systems**
- Low energy and resource demand during the installation phase
- Very low carbon footprint — very low GWP
- Lower weight on the structure
- Excellent aesthetic appearance

**Sika® ComfortFloor® systems for public buildings**
- Lower carbon footprint compared to alternative sheet flooring that requires levelling compounds and an adhesive: **Sika® ComfortFloor®** systems are directly and fully bonded to the substrate
- Excellent durability with the possibility of maintenance with simple refresher coats such as **Sikaflor®-305**, which also have the lowest Carbon Footprint.
- Approved solutions that comply with the International Standards for Very Low VOC emissions, plus they provide underfoot comfort and acoustic improvements that allow credit points in many Green Building Certifications programmes such as LEED.

**Sikaflor® PurCem® systems for the food industry**
- **Sikaflor®-24 PurCem®** has the lowest Global Warming Potential of solutions that can be installed in the manufacturing industry
- **Sikaflor®-20 PurCem®** and **Sikaflor®-21 PurCem®** have much lower cumulative energy demand compared to heavy duty ceramic tiles

**Sikaflor®-269 CR epoxy systems for clean room environments**
- Very low emissions, very low particle emissions and very low airborne molecular contamination to provide the cleanest air quality for clean rooms
- Low energy demand
- No need for additional adhesive, underlayment, or damp-proof membranes
Overview of ‘Green Building’ Certification Programmes

Over recent years, several countries and organisations have developed environmental certification programmes for buildings. Practical experiences together with their new findings have led to continuing adaptation and extensions of these programmes. The criteria for the different programmes are similar, whilst the evaluation can still differ substantially. Most Green Building Certification Programs focus on assessing whole buildings, rather than individual building systems or products. However requirements for individual product categories are included in several of the programmes (e.g. VOC content, VC emissions, acoustic / noise reduction, visual aesthetics, etc.). LCA’s can accurately characterize products and systems in terms of their sustainability performance. For specific information regarding these Certification Programmes, please contact your local Sika Company.

LEED (Leadership in Energy and Environmental Design)
www.usgbc.org/LEED
LEED is now the world’s best known and largest ‘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., however the LEED program is not currently LCA based.

How can Sika Flooring Systems contribute to your LEED Certification?

- Sika ComfortFloor systems can contribute to credit points in LEED program.
- Sika ComfortFloor Systems have passed the California Department of Health Services 01350 Small Chamber Emission Test, one of the most stringent emissions tests in the US market. Passing this test is considered an acceptable fulfilment of the requirement of LEED Low Emitting Material IEQ 4.3.(Low Emission material in the Flooring systems category).
- Indoor Environmental Quality Credit 4.1: adhesives – 1 point
- Indoor Environmental Quality Credit 4.2: coatings – 1 point

For further information, please visit http://usa.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 UK 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 defined performance criteria. The environmental impact is determined using LCA’s.

How can Sika Flooring Systems contribute to your BREEAM Certification?
For further details, please contact Sika Ltd. or visit www.sika.co.uk

DGNB Certification System
(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 currently in preparation. This is based on criteria for 6 areas, including 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 Flooring Systems contribute to your DGNB Certification?
For further details, please contact Sika Germany or visit www.sika.de
How can Sika Flooring Systems contribute towards your Green Building Certification rating?

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

- choosing Sikaflor® solutions that comply with Air Indoor quality controls
- controlling the emission of VOC’s with Sika solutions for public buildings and industry
- using Sika® ComfortFloor® solutions that reduce impact noise in the building
- enhancing the aesthetics of a building with decorative and coloured Sikaflor® systems for buildings and Sikaflor® car park deck solutions

How can Sika Flooring Systems contribute to your CASBEE rating?

For further details, please contact Sika Japan or visit http://jpn.sika.com

How can Sika Flooring Systems contribute to your CASBEE rating?

For further details, please contact Sika Japan or visit http://jpn.sika.com

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

For further details, please contact Sika Inc. or visit http://usa.sika.com

How can Sika Flooring Systems 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 provides a full range of specialist construction solutions from the Basement to the Roof. Please contact your local Sika organization for more details on our full range of sustainable construction solutions.

You Can Contribute to Sustainable Construction by:

- Selecting flooring systems that use less energy and resources
- Selecting flooring systems with a low Global Warming Potential (GWP) – reducing the carbon footprint of your building
- Investing in highly durable Sika flooring systems that have stood the test of time – saving energy and resources as well as costs over the service-life of the floor

Further Information on Sustainability

This link opens the Sika Sustainability webpage. It provides access to more information on Sika and sustainability, our partnerships and initiatives, our environment & safety policies, plus much more.