ENGINEERED REFURBISHMENT
Sikagard®-8500 CI

DUAL-PHASE CORROSION INHIBITOR FOR REINFORCED CONCRETE STRUCTURES

BUILDING TRUST

CLASS-LEADING CONCRETE PROTECTION PROVIDED BY SIKA

REINFORCED CONCRETE may be exposed to harsh environmental conditions that threaten its structural integrity. The Sika product families like SikaEmaco®, Sika MonoTop® and Sikagard® provide a raft of solutions ranging from major repair and strengthening to prevention and preservation.

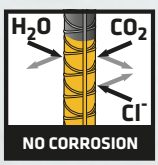
CONCRETE IS EXPOSED TO VARIOUS TYPES OF ATTACK. Corrosion caused by chloride attack and carbonation is the most demanding challenge for concrete structures and buildings. Protection is needed to reliably preserve the appearance of concrete and guarantee the longevity of concrete structures.

Concrete damage	Mechanical	Chemical	Physical
Reinforcement corrosion	Carbonation	Chloride attacks	Stray current

PRODUCT BENEFITS AT A GLANCE

Excellent application properties
Applied by spraying, roller or brush.

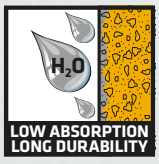
Durability
Long-lasting even in harsh environments. Effective even in cracked concrete.



Corrosion protection
Effective inhibition of both carbonation and chloride induced corrosion.

Certification, documentation and test reports
Tested in accordance with international standards.

Time-efficient installation
One-off installation costs.

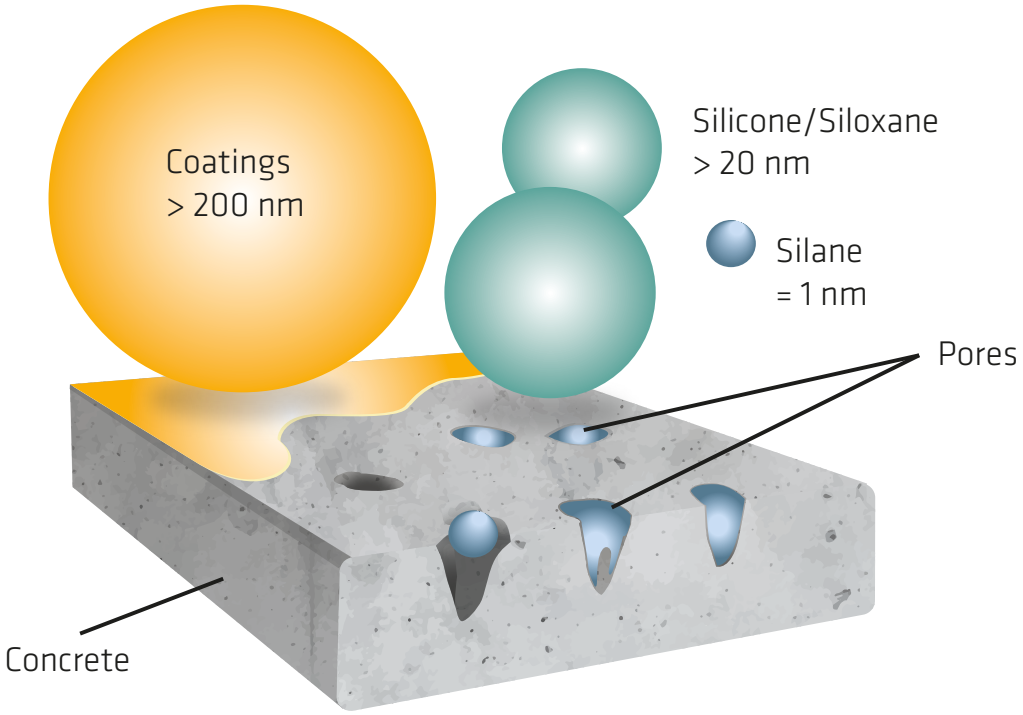


Significantly reduces water ingress
Protection against weathering effects.

DUAL-PHASE CORROSION INHIBITOR

Sikagard®-8500 CI is a clear liquid that, when applied to new or older concrete, combines the power of a 100% reactive penetrating corrosion inhibitor and a latent-phase corrosion inhibitor to mitigate electrochemical corrosion of reinforcing steel in new or older concrete, also in case of micro cracks.

In addition, the Silane inside the material (see image below) allows the concrete to dry out and prevents water-soluble contaminants from penetrating.



Sikagard®-8500 CI is the class-leading, proven solution for post-applied reinforced concrete protection.

Features	■ Does not form a layer on the surface and penetrates deep into the concrete – remaining protected against UV or weather exposure and surface degradation. ■ Dual-phase protection prevents anodic and cathodic corrosion reaction ■ Latent-phase corrosion inhibitor is activated if concrete cracks, or if moisture penetrates into the concrete ■ Significantly reduces water ingress
Advantages	■ Provides superior protection even in case of post-application cracks ■ Possible to post-apply protective coating for, e.g. aesthetic reasons ■ Surface appearance remains unchanged ■ Delays the onset of corrosion and reduces active corrosion significantly
Benefits	■ Extends the service life of the structure ■ Reduces maintenance costs and cost of operational downtime ■ One-off installation cost only
Certifications	■ Independently tested and certified by several research councils across the globe ■ Certified in accordance with European standards

A MORE DETAILED EXPLANATION

HOW TO DETECT CORROSION AT AN EARLY STAGE
Before corrosion results in visible damage to a concrete structure, there is an invisible corrosion process which can continue for periods between a few months and several years and even cause severe structural failure. Structures in extreme environments or at risk should be examined even if there are no visible signs in order to avoid the need for costly repairs.

RAPID MEASUREMENTS BY IN-SITU TESTS
The corrosion rate in a real concrete structure can be rapidly measured by in-situ tests using non-destructive handheld devices which induce galvanostatic pulses in the concrete and estimate the corrosion rate using numerical algorithms (expressed in $\mu A/cm^2$).

Corrosion rate ($\mu A/cm^2$)	Corrosion level of the structure	Estimated time until visible damage
< 0.1	Negligible (passivated)	–
from 0.1 to 0.5	Low	> 10 years
from 0.5 to 1.0	Moderate	3 – 5 years
> 1.0	High	< 2 years

TYPICAL CAUSES OF DAMAGE AND APPROPRIATE SOLUTIONS
There are two main corrosion processes: carbonation and chloride-induced corrosion. Carbonation is a process by which the natural pH of the concrete is reduced, eventually destroying the passive layer that protects the steel and allowing the steel to corrode. In chloride-induced corrosion, chloride penetrates the concrete. Once it reaches the steel, the passive layer is disturbed and corrosion pitting occurs.

DUAL FUNCTIONALITY OF Sikagard®-8500 CI
Sikagard®-8500 CI is a dual-function, silane-based, surface-applied corrosion inhibitor, suitable for use as part of a corrosion prevention, protection, or inhibition strategy. It is a revolutionary blend of high-quality silanes with an additional corrosion inhibitor, which lies dormant within the concrete until activated by moisture which penetrates the surface due to cracking or aging of the concrete.

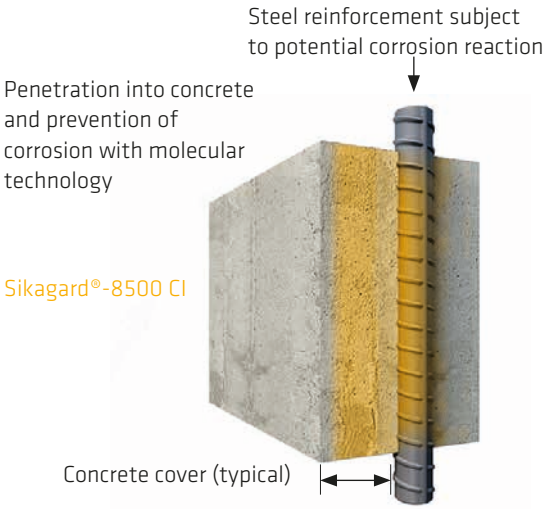
Sikagard®-8500 CI has dual functionality. The silane base provides similar benefits to water-repellent impregnating compounds and the integral corrosion inhibitors are carried into the concrete along with the silane. The inhibitors remain in the concrete until the water repellency diminishes over time, or until the concrete cracks. They then become mobile, and are carried deeper into the concrete by moisture. Sikagard®-8500 CI has a surface tension roughly 1/3 that of water, and low viscosity to improve penetration into concrete. Its special blend of silanes provides a balance between drying time and penetration over a wide temperature range, as well as lower VOC content and a higher flash point than many other corrosion inhibitors.

UNIQUE COMBINATION
This unique combination makes this product ideal for service life extension after the repair of spalled concrete and as a protective mechanism where surveys show that the structure is subject to a potential corrosion risk as a result of environmental conditions.

The degree of corrosion determines what action needs to be taken

FACTORS THAT INCREASE CORROSION POTENTIAL:

- Sea water (salt)
- Carbonation (loss of passivation layer)
- De-icing agents (salts)
- Insufficient concrete cover
- Cracks and delamination
- Mechanical damage



THE EFFECTIVE SOLUTIONS:

- Sikagard®-8500 CI – the liquid surface-applied corrosion inhibitor for large areas

Often in combination with

- SikaEmaco® or Sika MonoTop® series repair mortars for structural and non-structural damage repair
- Sikagard® coatings for further anti-carbonation protection, aesthetics

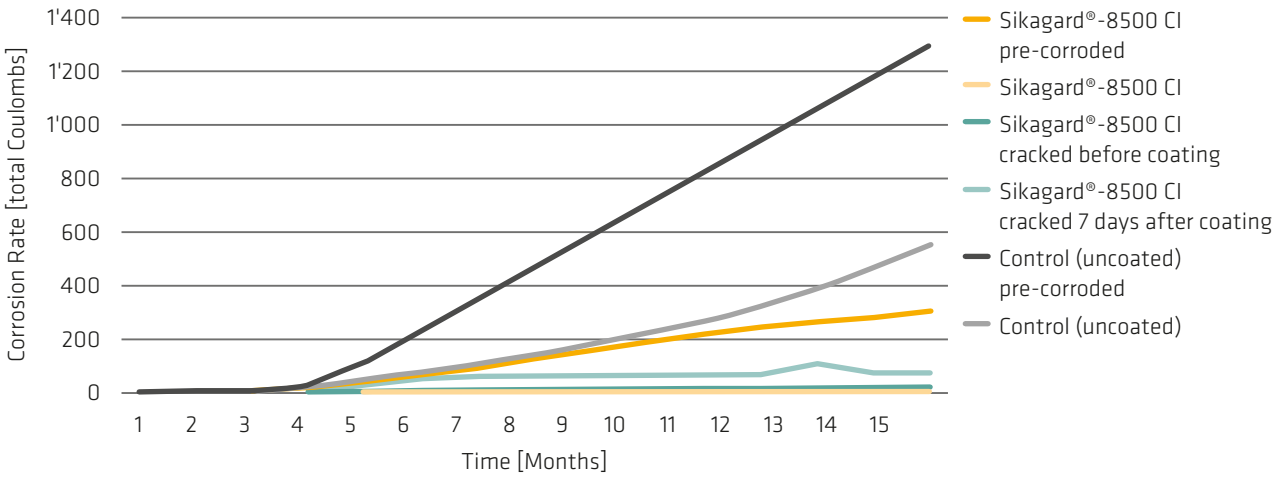
PROVEN PERFORMANCE

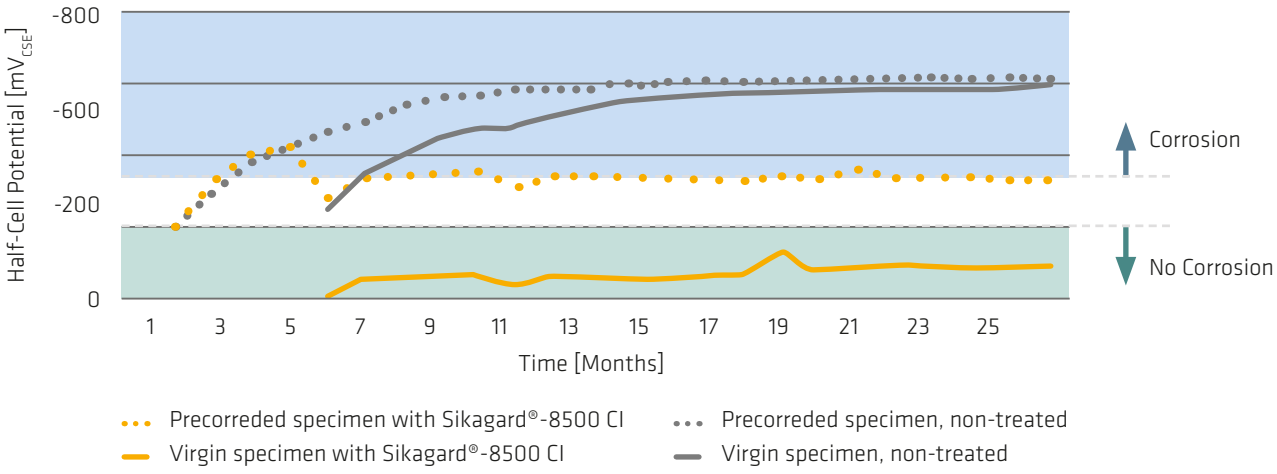
The effectiveness of Sikagard®-8500 CI has been proven by several independent test programs.

ASTM G 109

ASTM G 109 is a test method for "determining the effects of chemical admixtures on the corrosion of metals in concrete". Modified ASTM G109 testing was carried out. The concrete specimens were made without admixtures, were abrasive, blasted to ICRI CSP 5-6 after curing and then treated with Sikagard®-8500 CI. Ponding with 3% sodium chloride (NaCl) solution was initiated one week after treatment.

When compared with untreated concrete, in accordance with ASTM G109, concrete beams treated with Sikagard®-8500 CI exhibited a dramatic reduction in corrosion rate, even when the beams had been brought to an active corrosion state prior to treatment. Further, cracked concrete beams also showed significant reductions in corrosion rate after one year of testing, whether cracking was induced prior to application, or 7 days after application of Sikagard®-8500 CI.



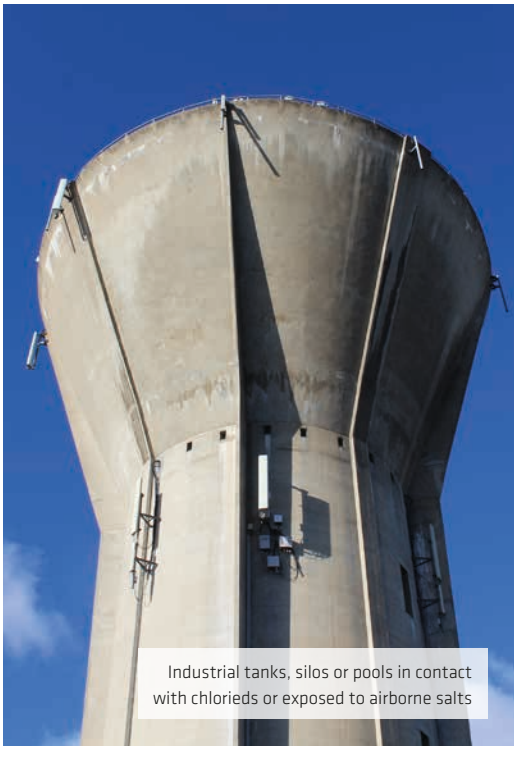


FIELDS OF APPLICATION

Typical structures with severe risk potential

Buildings located in coastal areas

Typical marine structures such as quays, jetties, bridges in direct splash zones



Industrial tanks, silos or pools in contact with chlorieds or exposed to airborne salts

Areas exposed to heavy use of any de-icing agents (salts), e.g. parking decks, bridges, viaducts

SAVING COSTS IN THE LONG RUN

Over the past decades, there has been an unprecedented increase in the use of concrete in infrastructure and industrial facilities, as well as commercial and residential buildings. But how long do concrete structures last?

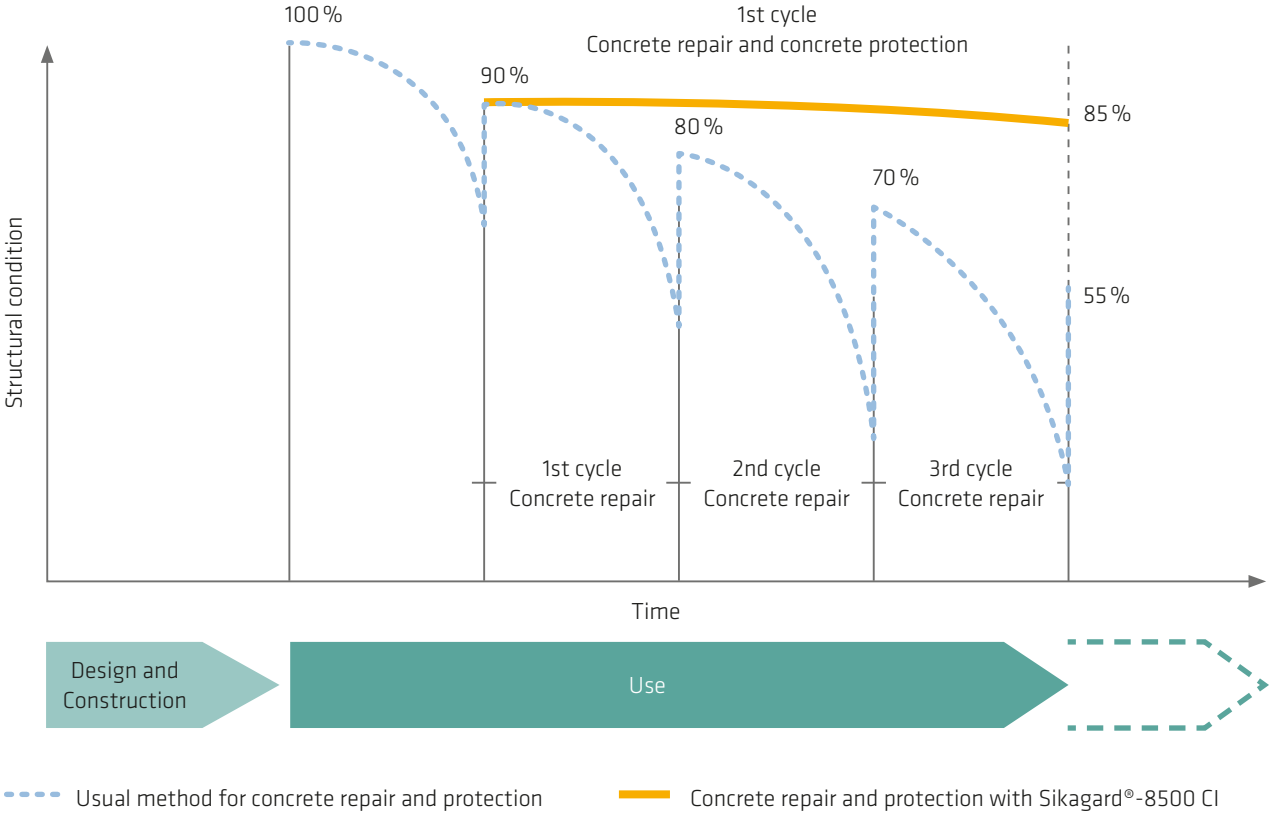
EXTENDING THE SERVICE LIFE OF CONCRETE STRUCTURES

Growing demand for longer service lives and the need to rehabilitate and renovate existing buildings have led to calls for prevention and repair techniques that match these durability expectations. Increasingly severe climatic, environmental and service conditions are posing new challenges for structures designed for longer service lives.

50%
cost reduction

Sikagard®-8500 CI allows significant cost reduction compared with traditional concrete repair methods. Total project savings can exceed 50% depending on conditions.

Example of interaction between protection materials and repair mortar
(depends on project conditions and is therefore different for each project)



ENSURING PROFITABILITY WITH OUR LCCA

For owners and engineers alike, calculating the benefits of a repair and protection method over a given life cycle is crucial to selecting the most cost-effective solution.

WE CAN PROVE THE COST-EFFECTIVENESS OF OUR SOLUTIONS

Sika has drawn upon expert knowledge from the industry to develop a life cycle cost analysis (LCCA) tool to assist our customers with this task. The output of an analysis can be readily made available to the project team in the form of a report.

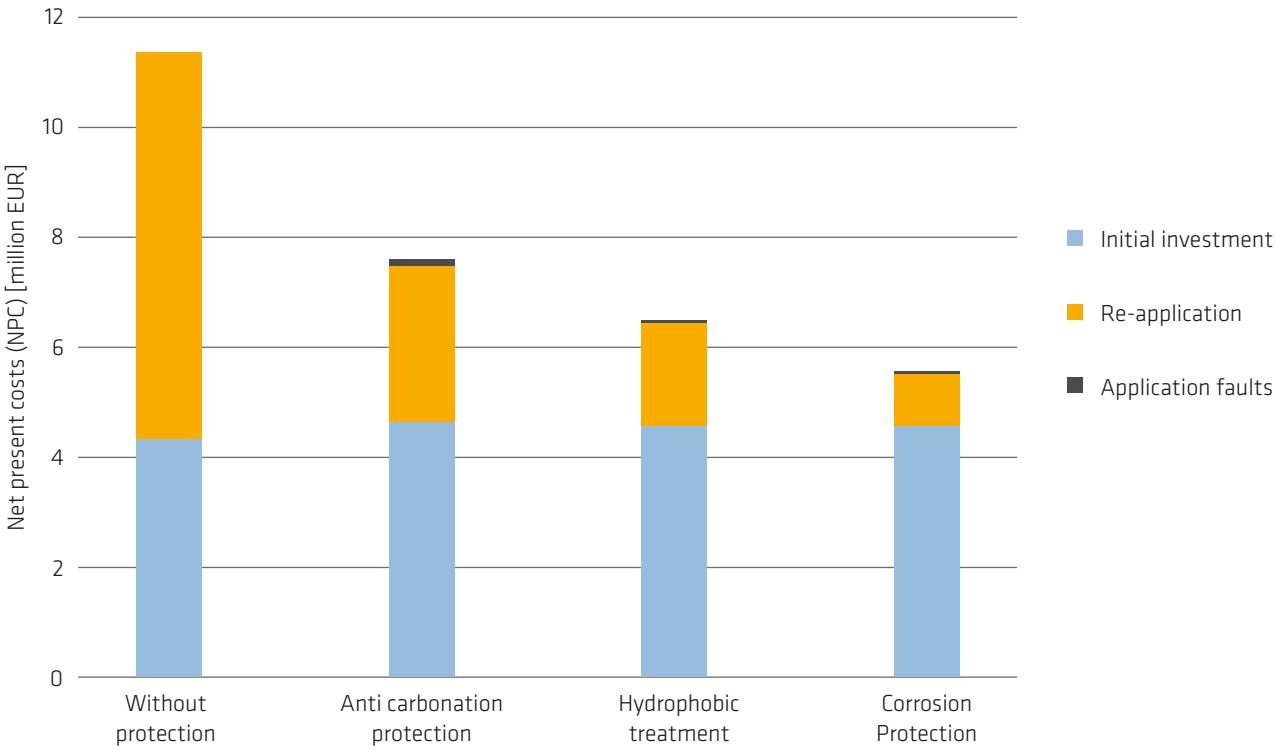
LIFE CYCLE COST COMPARISON – A CASE STUDY

A direct comparison of the proposed protection methods with a standard repair and maintenance approach: The case study results presented in the graphs below are based on a silo refurbishment project where crack repair using SikaInject® and structural repair with Sika mortars have been simulated. As a base case only the initial repair and recurring repair works have been modelled. In contrast, repair work will no longer be required in the future with Sikagard®-330 EL anti-carbonation coating, Sikagard® H 303 standard hydrophobic treatment and most favorable Sikagard®-8500 CI corrosion inhibitor – primarily as a result of its cost effectiveness – is the treatment of choice in this case study.

LCCA REPORT TYPICALLY INCLUDES:

- A life cycle cost comparison
- Annual cost analysis
- Cumulative net present cost (NPC) analysis
- Initial recommendation for most cost-effective solution

Sikagard®-8500 CI: Lowest overall cost
LCC comparison – cost breakdown



CHOOSING THE RIGHT SOLUTION FOR YOUR CHALLENGE

Safe and reliable solutions

In order to ensure durable concrete in the field, it may not be sufficient to meet the minimum requirements of EN 206. In addition to the design of the concrete, proper placement, including the required concrete cover, are key factors in achieving a durable structure.

SELECTING THE RIGHT SOLUTION

From design to curing – whenever a small deviation from the specified design and application occurs, it paves the way for concrete degradation and deterioration. Then it is only a question of time before accelerated carbonation, chemical attack and de-icing salts will start to damage the concrete and the structure as a whole. In order to avoid this kind of concrete degradation, protection materials are used for new and refurbished structures.

EXPOSURE CLASSES

The recommended surface-applied protection solution can be classified to match the major concrete exposure classes defined in EN 206-1 “Exposure Classes”.

Sikagard® Product Selector
(depending on the portfolio of the countries / regions)

	Decorative paint	Acrylic coatings	Corrosion inhibitors	Hydrophobic treatment	Resin-based coatings
Environment	No risk of corrosion or attack	Carbonation-induced corrosion	Chloride-induced corrosion	Freeze / thaw attack	Aggressive chemical environment
Exposure class code	X0	XC1 – XC4	XS1 – XS3 XD1 –XD3	XF1 – XF4	XA1 – XA3
Solution		Sikagard®-5500 / Sikagard®-330 EL	Sikagard®-8500 CI	Sikagard®-705 L	Sikagard®-63 N / Sikagard®-7000 CR

ACCESS TO EXPERTISE AND KNOWLEDGE FROM AROUND THE WORLD

Our Sika experts are committed to providing the right information and the most cost-effective solution for your concrete protection or restoration challenge.

ENHANCE THE VALUE OF YOUR STRUCTURE

By providing an early preliminary diagnosis and assessment of the current situation and recommending the right solutions for protection against the ingress of carbon dioxide, water and chloride ions from the start, we can significantly enhance the value and service life of your structure, and prevent further deterioration and spalling.

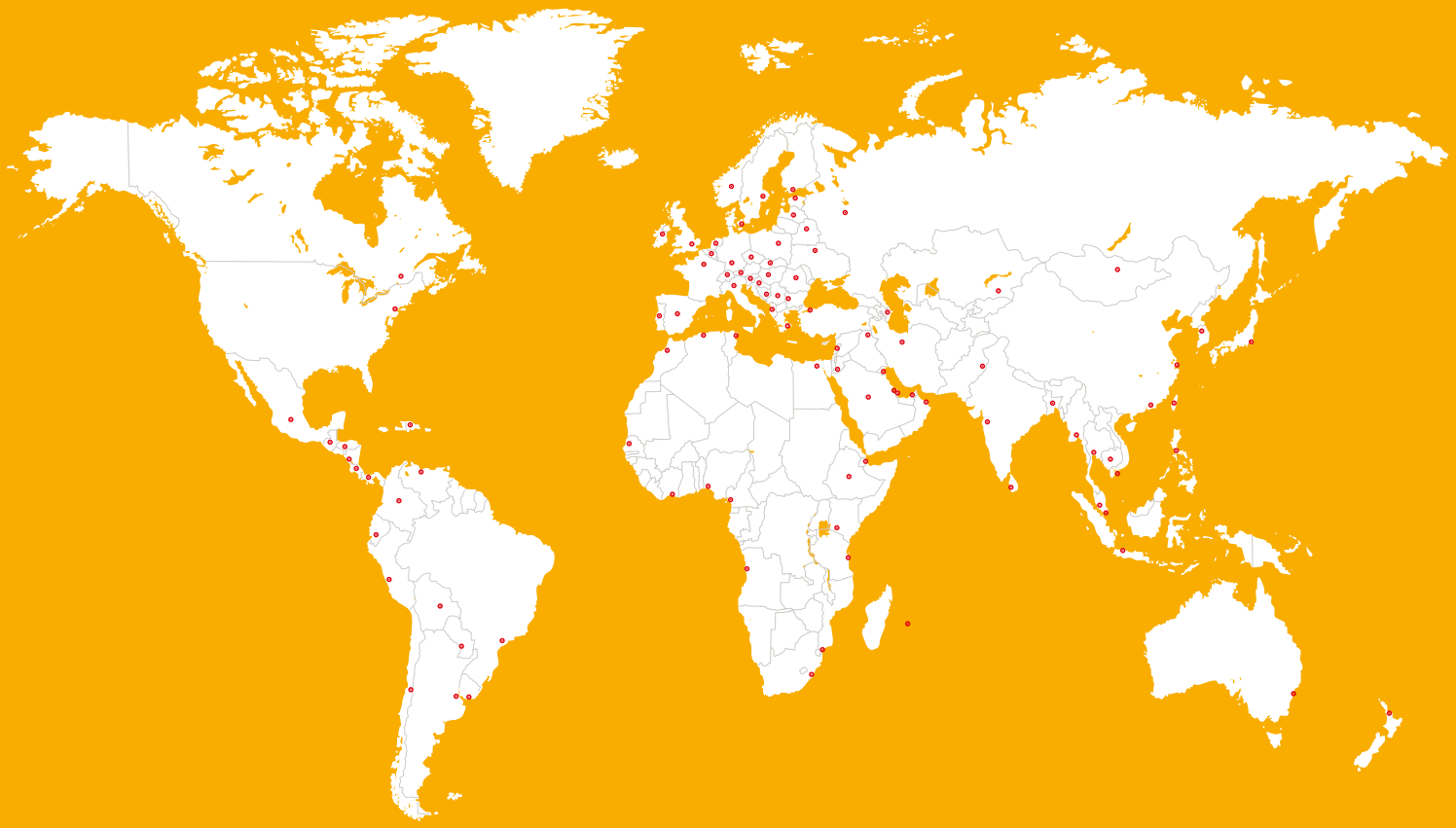
CORROSION RATE MEASUREMENTS BY SIKA TECHNICAL EXPERTS

- Early detection of corrosion potential is key to effective protection and repair solutions.
- Please contact your local sales consultant or adviser, depending on what you normally use to assist with an early assesment of your project.

Find your local contact at www.sika.com

Sika expert talking to the customer on a project site

GLOBAL BUT LOCAL PARTNERSHIP



WE ARE SIKA
Sika is a specialty chemicals company with a globally leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing, and protection in the building sector and automotive industry. Sika has subsidiaries in 103 countries around the world and, in over 400 factories, produces innovative technologies for customers worldwide. In doing so, it plays a crucial role in enabling the transformation of the construction and vehicle industries toward greater environmental compatibility. With more than 33,000 employees, the company generated sales of CHF 11.2 billion in 2023.

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