



# TECHNOLOGY AND CONCEPTS TOTAL CORROSION MANAGEMENT SYSTEMS

# MORE VALUE, LESS IMPACT

## INTRODUCTION

When you have a reinforced concrete structure that is starting to corrode Sika is the partner of choice. As the only construction manufacturer able to supply a comprehensive range of products for total corrosion management in the UK, Sika ensures the right solution for every project is recommended. Whether your building requires full protection with the use of galvanic anodes, discrete anodes or inhibitors, to coated or non-coated buildings, Sika has the products. By having a range of solutions, a compatible combination of design can be specified to ensure Sika meets the needs of the client, budgets and provides maximum long-term protection to the building.

Everyone wants to work with an expert, which is why Sika is the single source supplier of choice for the owner, designer and contractors. Backed by decades of experience, Sika provides the expert guidance you require to safeguard your project - be it repair or protection to buildings, bridges or steel framed buildings. Over the years Sika has developed an enviable knowledge of the refurbishment sector - identifying problems along the way, which means time well saved for you and your clients. Leave your project in the expert hands of Sika, you can be confident of a successful working partnership and a rewarding refurbishment project, fit for decades ahead.

## SIKA AT A GLANCE

17,000+ TEAM MEMBERS  
90 COUNTRIES  
170 FACTORIES WORLDWIDE  
70+ NEW PATENTS 2014  
£3.8 BN NET SALES 2014  
£115 MILLION SPENT ON R & D

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## SUSTAINABILITY

Environmental responsibility is a key consideration for Sika and is reflected in our achievement of the internationally recognised ISO14001 standard and the continual development of our Environmental Management System. We strongly believe in the holistic approach to sustainable development as demonstrated by the introduction of the Global Reporting Initiative (GRI) to G4 for our annual report and our ongoing commitment to ISO 9001 (Quality framework) and OHSAS 18001 (Occupational health and safety management system). As such we strive to develop high quality, long life products, ensuring that whole life performance is maximised.

Repairing an existing structure is just the beginning of sustainability in the built environment. Repairing with time-tested products that result in long-term durability is sustainability taken to the higher level. Supplying the products in a responsible manner achieves yet another level of sustainability. When the company has been at the forefront of concrete repair and protection for over 100 years, the result is the ultimate in sustainability. Sika is committed to maximising the value of our solutions and contributions whilst reducing risks and resource consumption enabling our customers to in turn maximise value whilst minimising the environmental impact.



## SIKA SERVICES

- In accordance with EN 1504 Principles
- Full support from initial consultation to site
- Expert advice - someone on hand at the end of a phone
- Professional specification documents for clients
- Solutions available offering up to 25 years protection
- Provision of bespoke solutions for entire building or specific problem area
- Comprehensive Total Corrosion Management Product Portfolio
- On - Site Support

# SECTORS



Bridges



Car Parks



Steel Framed Masonry Buildings



Concrete Buildings



Marine Structures



Industrial Facility

# CORROSION IN REINFORCED CONCRETE STRUCTURES

## AGGRESSIVE INFLUENCES ON REINFORCED CONCRETE

In reinforced concrete the steel is normally protected against corrosion by the passivating alkalinity of the cement matrix. Due to the ingress of aggressive environmental influences the steel can corrode. Three conditions must exist for reinforcing steel to corrode:

- The passivation of the steel must have been destroyed by chlorides or by carbonation
- The presence of moisture as an electrolyte
- The presence of oxygen

### CARBONATION

Carbon dioxide ingress causes carbonation of the cement matrix progressively reducing the passivating alkaline protection of the steel reinforcement to a level where corrosion can occur.

### CHLORIDE ATTACK

Chloride ions from deicing salts or marine exposure are carried into the concrete in solution in water. At the steel surface, even in alkaline concrete, they attack and break down the passivating layer and then accelerate the steel corrosion process.

## THE EFFECT OF THE AGGRESSIVE INFLUENCES

### CHLORIDES/CARBONATION

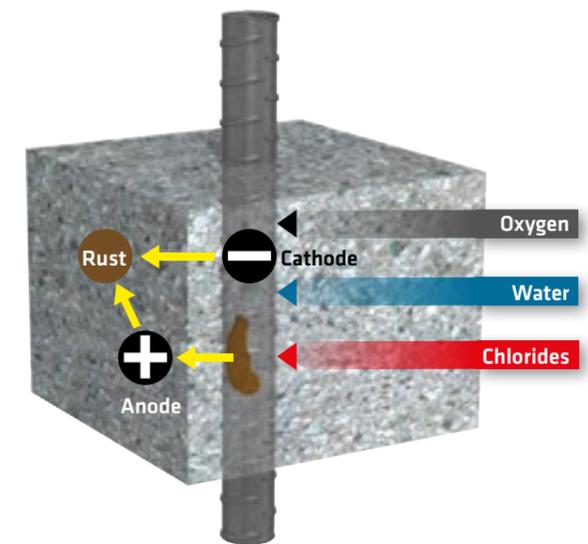
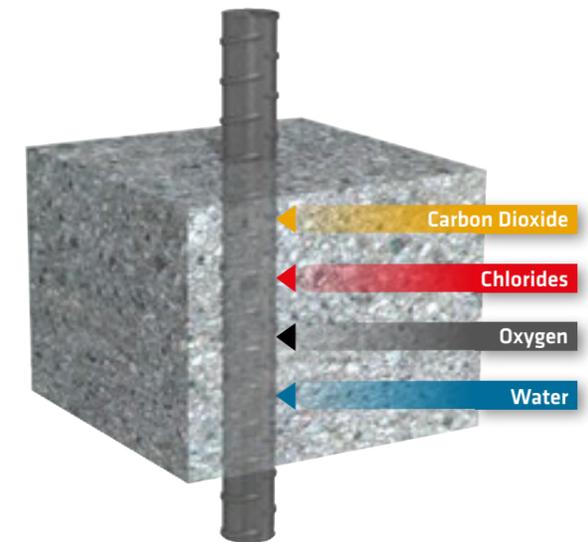
As soon as sufficient chloride ions (from deicing salts or marine exposure) or the carbonation front have reached the steel surface, the passive layer is destroyed and corrosion accelerates.

### CONTACT WITH WATER (MOISTURE)

The original neutral iron will receive a negative charge as the positively loaded ions have the tendency to dissolve. The water film around the metal turns positive.

### CONTACT WITH OXYGEN

The oxygen takes on the negative charge of the iron ions which have gone into solution. The result is iron hydroxide, the first stage of rust.



# MULTI-FUNCTIONAL CORROSION INHIBITORS

## SIKA OFFERS A FULL RANGE OF SYSTEMS REQUIRED FOR THE TECHNICALLY CORRECT REPAIR AND PROTECTION OF CONCRETE TO MEET EN 1504.

From protection against ingress to control of anodic areas, the BS 11 Principles allow engineers to specify the appropriate solution for any situation.

Sika® Ferrogard®-903<sup>+</sup> is a unique blend of non toxic, organic corrosion inhibitor based on amino alcohol and salts of amino alcohol technology, designed for use as an impregnation on hardened reinforced concrete.

Sika® Ferrogard®-903<sup>+</sup> is a multifunctional inhibitor which controls the cathodic and anodic reactions. This dual action effect significantly retards both the onset and the rate of corrosion and increases the time to future maintenance. Sika® Ferrogard®-903<sup>+</sup> is normally applied as part of a corrosion management strategy.

It is compatible and a component of all the Sika concrete repair and protection systems.

### THE PERFORMANCE OF Sika® Ferrogard®-903<sup>+</sup>

#### PROTECTIVE LAYER

Sika® Ferrogard®-903<sup>+</sup> forms an adsorbed protective film on the reinforcement. The process of forming this protective film takes place in carbonated concrete and chloride contaminated concrete.

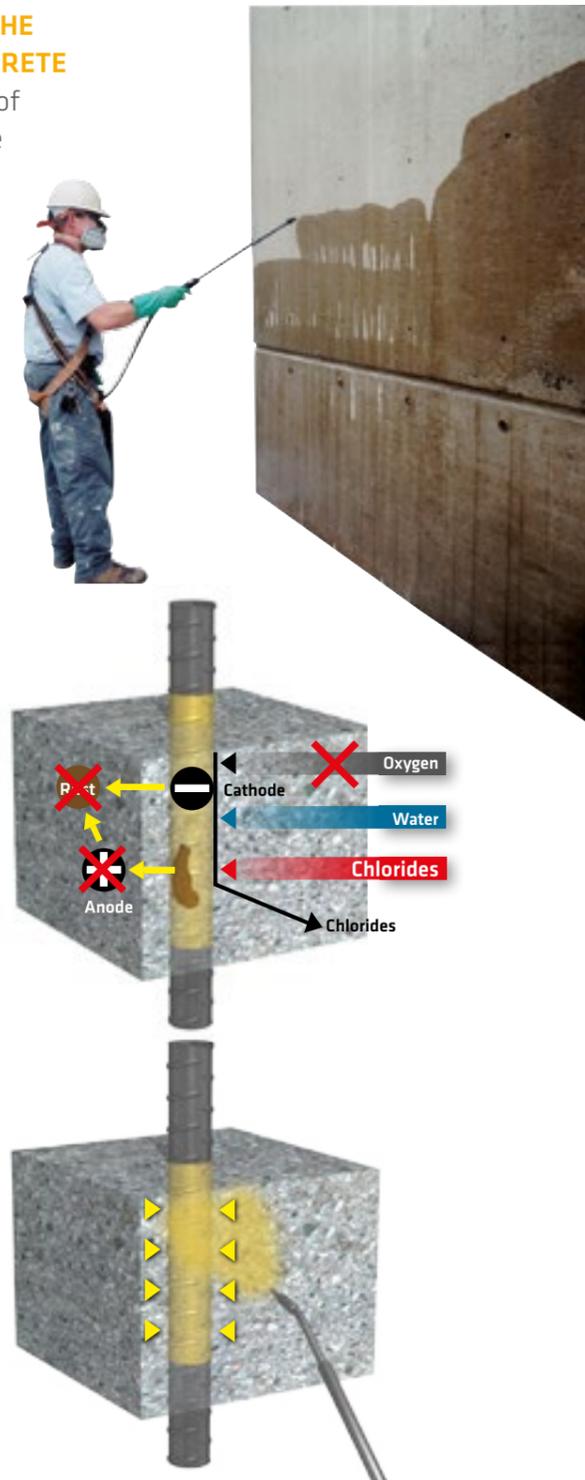
#### DELAY OF THE CORROSION PROCESS

- The dissolution of the iron in contact with water will be reduced thanks to this passivating protective film
- This film is also a barrier to the reduction of oxygen which will be prevented

#### APPLICATION

Sika® Ferrogard®-903<sup>+</sup> is applied as an impregnation by spray, roller or brush onto the surface of the concrete. The corrosion inhibitor penetrates into the concrete and protects the reinforcement by forming a protective film on the steel surface. Through this the onset of corrosion is delayed and the rate of corrosion reduced.

#### Protection Level

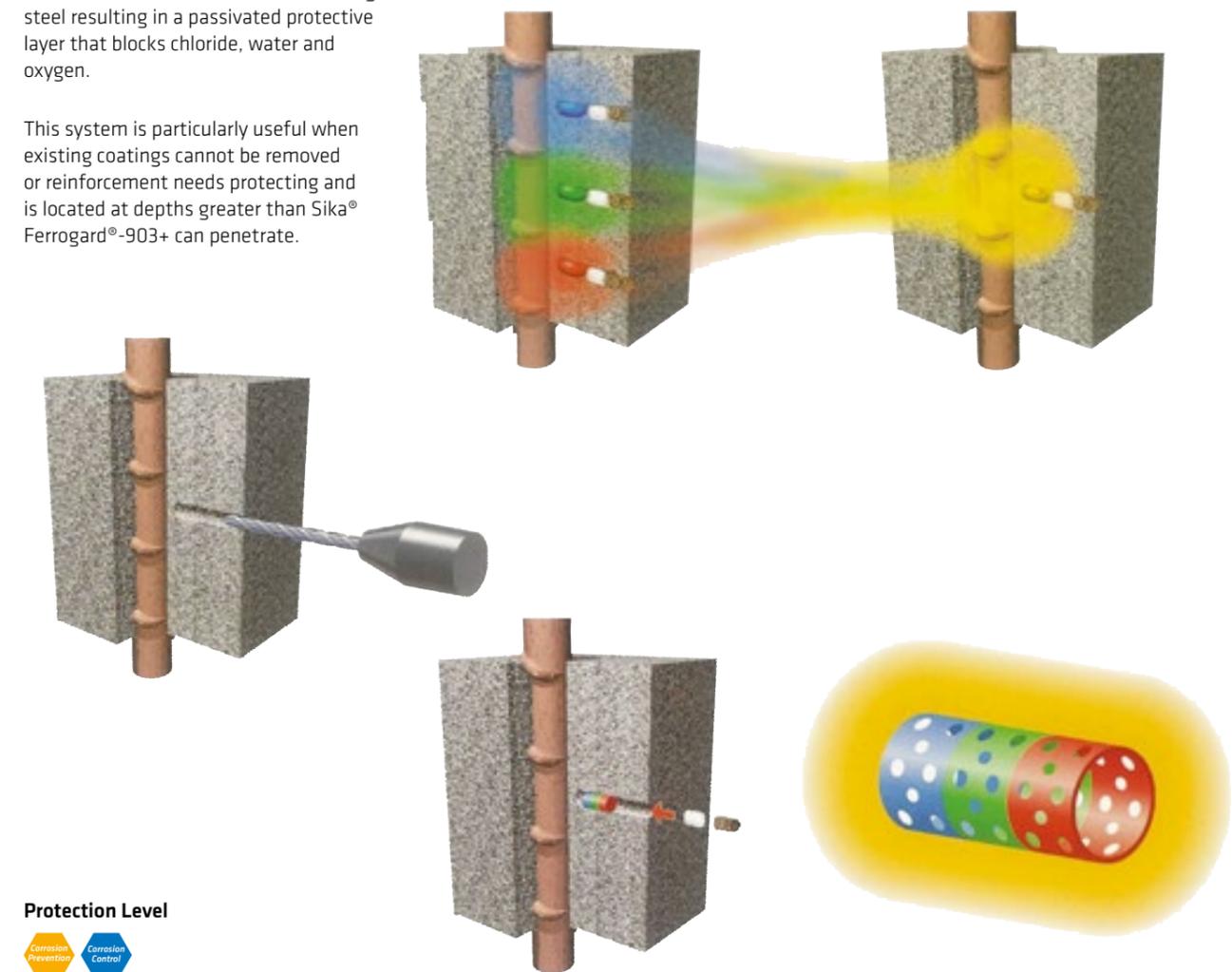


# VAPOUR PHASE CORROSION INHIBITORS

## SIKA® MARGEL VPI 580

Sika® Margel VPI 580 is a vapour phase corrosion inhibitor, which is inserted within the concrete structure close to the reinforcing steel. The product has been specifically developed to ensure the corrosion inhibiting vapours are released over a period of 12 months. This results in a well bonded layer of corrosion inhibitor around the reinforcing steel resulting in a passivated protective layer that blocks chloride, water and oxygen.

This system is particularly useful when existing coatings cannot be removed or reinforcement needs protecting and is located at depths greater than Sika® Ferrogard®-903+ can penetrate.



#### Protection Level



# EMBEDDED GALVANIC AND IMPRESSED CURRENT CATHODIC PROTECTION ANODES

This range includes the Sika® Galvashield® and Sika® Ebonex® range of embedded galvanic and impressed current cathodic protection anodes – both world-renowned and cost-effective corrosion control systems. These products protect embedded metals in concrete and masonry structures including bridges, buildings, multi-storey car parks, marine structures and industrial facilities.



## GALVANIC SYSTEMS

Galvanic systems provide dependable protection through the use of sacrificial anodes. As there is no need for an external power source, galvanic systems are a popular choice for effective low maintenance corrosion mitigation.



## IMPRESSED CURRENT SYSTEMS

Impressed current cathodic protection systems are installed to provide a high level of corrosion mitigation. These systems utilise inert anodes to distribute protective current to the reinforcing steel. Impressed current systems should be monitored and maintained over time to ensure their effectiveness.



# GALVANIC AND IMPRESSED CURRENT SYSTEMS



## Sika® Galvashield® XPT

**Description**  
Bar shaped discrete anode – Alkali-activated zinc – 2G Technology.

**Application**  
Targeted corrosion prevention for patch repairs and joints. Low concrete cover or congested steel spacing.

**Product Details**  
Corrosion prevention spacing: 175 - 750mm.

**Service Life**  
10-20 years.

### Protection Level



## Sika® Galvashield® XP2

**Description**  
Oval shaped discrete anode – Alkali-activated zinc – 2G BarFit groove for secure anode placement.

**Application**  
Targeted corrosion prevention for patch repairs and joints.

**Product Details**  
Corrosion prevention spacing: 300 - 750mm.  
Corrosion control spacing: 200 - 600mm

**Service Life**  
10-20 years.

### Protection Level



## Sika® Galvashield® XP4

**Description**  
Oval shaped discrete anode – Alkali-activated zinc – 2G BarFit groove for secure anode placement.

**Application**  
Targeted corrosion prevention or corrosion control for patch repairs and joints. High chloride or high steel density structures.

**Product Details**  
Corrosion prevention spacing: 150 - 750mm.

**Service Life**  
10-20 years.

### Protection Level



## Sika® Galvashield® CC

**Description**  
Cylindrical shaped discrete anode – Extra long tie wires – Alkali activated zinc 2G Technology.

**Application**  
Corrosion control for concrete.

**Product Details**  
Corrosion control spacing: 325 - 700mm

**Service Life**  
10-20 years.

### Protection Level



## Sika® Galvashield® DAS

**Description**  
Embedded anodes for distributed protection – Alkali-activated zinc.

**Application**  
Galvanic encasements – Jacketing - Overlays.

**Product Details**  
Based on service life and protection requirements.

**Service Life**  
10-40 years.

### Protection Level



## Sika® Ebonex® CC

**Description**  
Cylindrical or star-shaped discrete IC anodes with high current capacity Built-in ventilation – Crimps or electrical connectors – Ebofix grout.

**Application**  
Global or targeted impressed current cathodic protection – Reinforced concrete or masonry structures

**Product Details**  
Anode sizes 8 - 28mm diameter, lengths upto 200mm. Anode spacing based on design requirements.

**Service Life**  
25+ years.

### Protection Level



Please find key for the above symbols on page 10.

# LEVELS OF PROTECTION

Total corrosion management product selector guide

	INHIBITORS		GALVANIC ANODES					DISCRETE ANODE
	Ferrogard®-903+	Margel VPI580	Galvashield® XPT	Galvshield® XP2	Galvashield XP4	Galvashield DAS	Galvashield CC	Ebonex
<b>CARBONATED INDUCED CORROSION (no chlorides)</b>								
	✓ (P)(C)	✓ (P)(C)	X	X	X	X	X	X
<b>APPLICATION AREA</b>								
Outside Repair	✓	✓	X	X	X	X	X	X
Inside Repair	✓	X	X	X	X	X	X	X
<b>CHLORIDE STATE AND CHLORIDES - %</b>								
<b>CHLORIDE INDUCED CORROSION</b>								
Low <0.5%	✓ (P)(C)	✓ (P)(C)	✓ (P)	✓ (P)(C)	✓ (P)(C)	✓ (P)(C)	✓ (P)(C)	✓ (Pr)
Moderate <1.0%	✓ (P)(C)	X	✓ (P)	✓ (P)(C)	✓ (P)(C)	✓ (P)(C)	✓ (P)(C)	✓ (Pr)
High 1-2%	X	X	✓ (P)	✓ (P)	✓ (P)(C)	✓ (P)(C)	✓ (P)(C)	✓ (Pr)
Very high >2%	X	X	X	X	✓ (P)	✓ (P)(C)	✓ (P)(C)	✓ (Pr)
<b>APPLICATION AREA</b>								
Outside Repair	✓	✓	X	X	X	X	✓	✓
Inside Repair	✓	X	✓	✓	✓	✓	X	✓

SIKA RANGE INCLUDES THREE DIFFERENT TYPES OF CORROSION PROTECTION:

 <p><b>Corrosion Prevention (P)</b></p> <p>Used to prevent corrosion activity from initiating in contaminated concrete. If concrete repair projects are completed in accordance with industry guidelines, the replacement of damaged concrete will address the areas with the highest level of corrosion activity. After the repairs are completed, new corrosion sites are likely to form in the remaining concrete, new corrosion sites are likely to form in the remaining contaminated concrete which was passive before the repairs. Research in the area of corrosion prevention indicates that a low applied current density (in the order of 0.4mA/m<sup>2</sup> of steel surface area) is effective at preventing the initiation of corrosion in concrete. The required current will decrease over time as chemical reactions increase the alkalinity and decrease the concentration of chloride ions around the reinforcing steel.</p>	 <p><b>Corrosion Control (C)</b></p> <p>Utilised when active corrosion exists. The use of corrosion control systems will provide a reduction in the corrosion rate and increases the service life of the rehabilitated structure.</p>	 <p><b>Protection (Pr)</b></p> <p>Provides active long term protection. Cathodic protection should be selected when the highest level of protection is necessary and the cost is economically justified. Current industry standards for cathodic protection are based upon a 100 mV depolarisation acceptance criteria. This level of protection generally required an initial operating current between 5 and 20 mA/m<sup>2</sup>. Current may be provided by galvanic anodes or by an impressed current power supply. Impressed current systems should be monitored and maintained over time.</p>
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**NOTE:**

Level of corrosion protection: **Prevention (P)** Prevents initiation of new corrosion activity. **Control (C)** Reduces ongoing corrosion activity. **Protection (Pr)** Reduces or eliminates ongoing corrosion activity.

Other factors may need to be considered such as Concrete Moisture content, accessibility, additional corrosion information etc before selecting appropriate products.

All chloride level % values are **free** chlorides by mass of cement at level of reinforcement.

# SIKA FULL RANGE SOLUTIONS FOR CONSTRUCTION:



WATERPROOFING



CONCRETE



REFURBISHMENT



MERCHANT



SEALING AND BONDING



FLOORING



ROOFING



INDUSTRY

## WHO WE ARE

Sika Limited and Sika Ireland Limited are part of the global Sika Group, specialising in the manufacture and supply of chemical based products for construction and industry. Sika is a world-leader in its field with subsidiaries in 90 countries around the world and manufactures in over 160 factories. With approximately 17,000 employees Sika generates annual sales of CHF 5.6 billion (£3.9bn). We are also committed to providing quality, service, safety and environmental care.

In the UK and Ireland, we provide market-leading solutions for concrete, waterproofing, roofing, flooring, refurbishment, sealing & bonding, and industry, and have manufacturing sites in Welwyn Garden City, Preston, Leeds and Dublin with more than 700 employees and a turnover of more than £190 million.

The information, and, in particular, the recommendations relating to the application and end use of Sika® products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users should always refer to the most recent issue of the Product Data Sheet for the product concerned, copies of which will be supplied on request.



FM 12504



EMS 45308



OHS 585274

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