



# REFURBISHMENT SIKA SOLUTIONS FOR THE REFURBISHMENT OF CONCRETE BRIDGES

BUILDING TRUST





# CONCRETE BRIDGES

## Important and valuable infrastructure

Throughout history, bridges have always been important and valuable structures in their own right and as part of our infrastructure, allowing faster and easier communication and transportation for people, livestock and merchandise. This means that by their very nature, bridges are built in areas where the topography, the ground conditions, or other existing structures and developments mean that these locations are not suitable for conventional pathways, roads or railway construction.

Therefore bridges are found in a wide variety of the most challenging and exposed environments – crossing ravines, around mountains, over valleys, lakes, rivers and even seas or other urban buildings and structures. Due to the seemingly continuous increase in traffic frequency and design load across our bridge structures, additional stress and strain are also constantly being imposed on them.

Modern bridges are built predominantly in reinforced concrete and are these are generally designed with a service life expectancy of more than 100 years. Recent surveys in both Europe and North America have shown that the majority of our existing bridges already exhibit some significant degree of degradation and many of them are therefore in need of substantial and often urgent, repair and refurbishment works.

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# REFURBISHMENT OF CONCRETE BRIDGES WITH SIKA

Long Lasting, Cost Effective and Sustainable

## DURABILITY

Reinforced concrete bridges are designed to maintain their service and function over long periods of time. During this service life, the concrete is subjected to many aggressive influences, including variable loading and vibration, extreme weather conditions, the presence of chlorides in de-icing salts and cycles of freeze and thaw, plus airborne chlorides in marine environments.

For new bridges, Engineers need to produce concrete that is able to achieve this long service life. All relevant Codes of Practice and Standards must be closely followed, including adequate concrete cover over the steel reinforcement, good compaction and no voids etc. Many of our existing concrete bridges are not built according to these latest standards, which is one reason for the damage and deterioration that results in a significant reduction of their life expectancy. To reduce maintenance costs, materials should only be applied that have proven durability, can increase the service life and reduce the frequency of such maintenance. Sika provides an extensive range of solutions for the repair, protection and strengthening of concrete and also steel bridge structures, to ensure that they can meet their required durability.

## LIFE CYCLE MANAGEMENT

Appropriate life cycle costing and management in all areas of bridge design, construction and management, including the correct maintenance, not only safeguards the owners investment, but also ensures the safety of the bridge users, maintains the level of its capabilities and community functions; plus frequently these landmark structures can also become an important part of a city, region or even a national heritage.

Life cycle costing and management provides bridge owners with the best approach to minimising any closure times and increasing the periods required between scheduled maintenance works, thereby also achieving the lowest total cost over the full service life of the structure.

Sika provides bridge owners and their maintenance managers the right design and planning tools, followed by well designed and proven, complete refurbishment solutions and systems, to considerably increase the time between the necessary maintenance and / or repair cycles. This is of considerable help in saving not only in the overall defined life cycle costs, but also in saving the bridge owners and the bridge user's time, the personal costs of delays and closures, plus the environmental impact of their bridges.

## SUSTAINABILITY

In addition to durability, sustainability and responsibility for the environment have become an increasingly important component of the requirements for the refurbishment of bridge structures. Indeed the environmental impact of any such public works is also an increasingly important part of every projects pre-contract 'risk assessment' under the latest regulations.

The responsible use of our limited natural resources is essential for future generations, therefore the whole bridge refurbishment process also has to be considered in relation to the selection of refurbishment materials that sustainable and ecologically harmless so far as is possible. This also includes the potential to minimise pollution increasing traffic delays, power consumption in the materials production, safe waste and packaging disposal and minimising the use of scarce resources.

Sika is striving for a more sustainable environment by optimizing our logistics, reducing energy consumption, reducing natural resources in our production processes and by developing innovative, solvent free refurbishment solutions to limit the release of VOC's (volatile organic compounds) for example. In addition Sika actively supports many varied green projects on a global, regional and local basis worldwide, to create a more sustainable future.

## SIKA - 100 YEARS OF EXPERIENCE

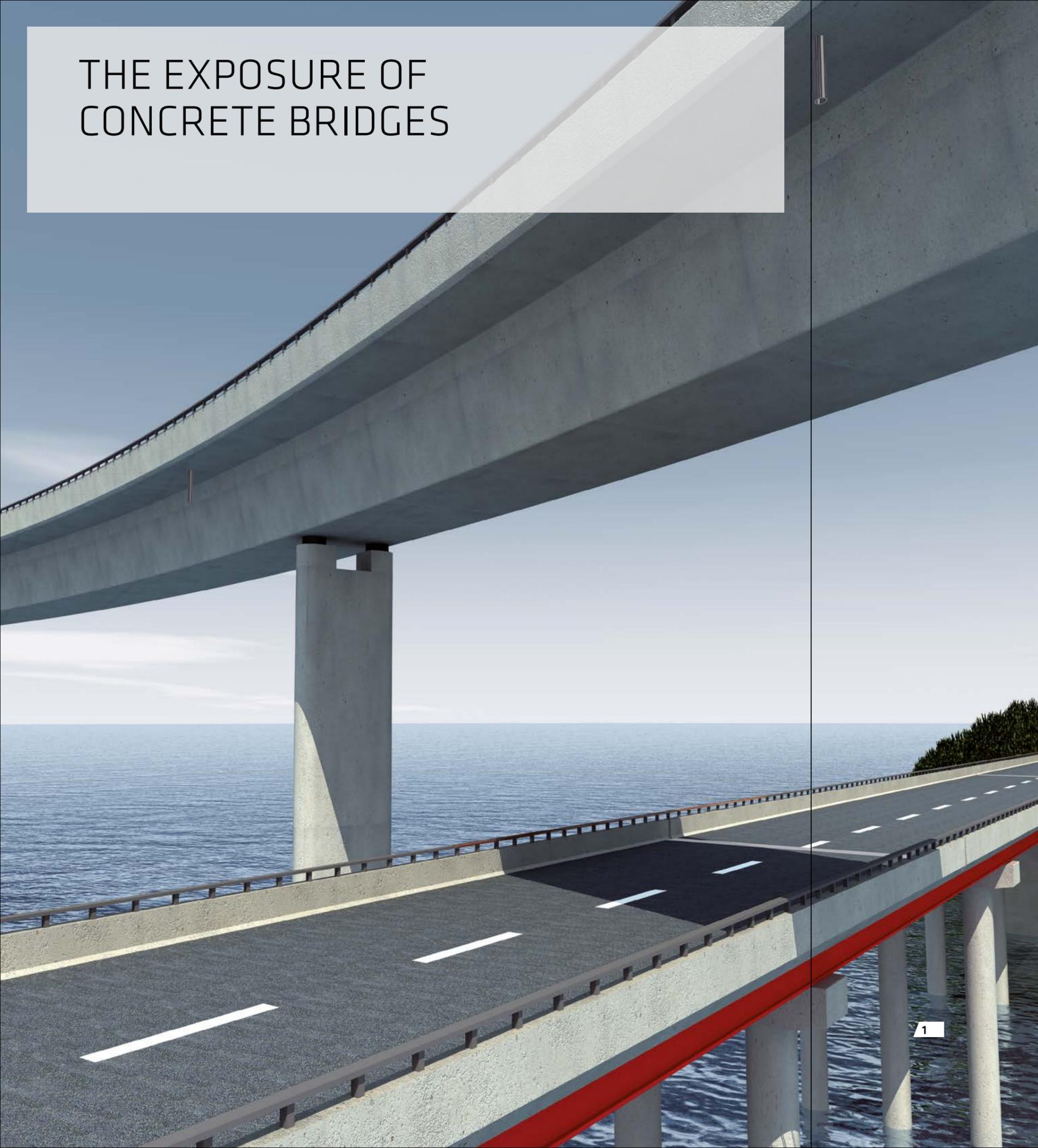
Sika has experience in the refurbishment of all types of reinforced concrete structures. With well known, well proven and innovative systems in our complete product range, Sika can provide bridge maintenance contractors and their customers with the appropriate solution for all types of bridge refurbishment and maintenance works. These include: concrete repair and protection, structural deck waterproofing, structural strengthening, steel corrosion protection, watertight joint sealing, high performance grouting and structural bonding solutions (rigid and elastic). Sika's depth of expertise comes from a world wide experience in bridge maintenance and refurbishment, gained during more than 100 years in the complex business of construction chemicals.

Sika produces consistent quality controlled products and systems, with solutions for bridge refurbishment, all supplied to site through efficient logistics. Overall it is our well trained Sika specialists that are the key factors for our success in providing durable, cost efficient and effective bridge refurbishment solutions.

Numerous successful projects around the world reflect the satisfaction of our many customers: Bridge Owners and Operators, Consulting Engineers and other Specifiers, Main Contractors, Specialist Contractors and Material Distributors are all benefitting from the unique "Added- Values" from Sika.



# THE EXPOSURE OF CONCRETE BRIDGES



## Water Ingress

Water can penetrate naturally through the capillary pore structures of reinforced concrete. In areas of carbonated concrete, or where there is a high chloride content on the surface of the steel reinforcing bars, reinforcement corrosion, cracks or spalling can occur on the surface.



## Dynamic and Static Load

Overloading due to increasing traffic loads, inadequate design, damage to the structure, stress / fatigue failure, earthquake effects, or any other mechanical impact such as vehicle impact, can all exceed or reduce the load capacity of the structure



## Wide Temperature Variation

By their nature and locations, bridges are subjected to a wide variation of temperatures between day and night / winter and summer conditions, or between different sides or surfaces of the structure. These frequent cycles result in thermal stresses and movement in the concrete structure that can also result in cracks.



## Carbon Dioxide

Carbon Dioxide ( $\text{CO}_2$ ) reacts with the Calcium Hydroxide ( $\text{Ca}(\text{OH})_2$ ) in the pore liquid of the cement matrix of concrete structures and deposits as calcium carbonate ( $\text{CaCO}_3$ ). This process known as carbonation reduces the protection of embedded steel reinforcement, when the process reaches the reinforcement bars.



## Chlorides Ingress

Chlorides come from de-icing salts used in winter, or from salt water in marine environments. They can penetrate the concrete structure and once they reach the reinforcement bars, they can locally destroy the passivation film causing fast pitting corrosion.



## Freeze / Thaw Action

The freeze thaw process creates stresses in the concrete matrix due to the expansion of free water in the capillary pores during freezing conditions; this can result in scaling of the surface of poor quality concrete. This action is also greatly accelerated by the presence of chlorides in the water.



## Surface Erosion / Abrasion

Concrete elements submerged in water such as the bridge piers or columns, are continuously exposed to erosion and abrasion of their surfaces. Damage occurs from the action of fast flowing water, and the particles of sand or other solid materials in the water.

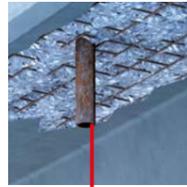


## Fire Damage

Fire due to traffic accidents, for example, can result in a reduction of the structural integrity of any of the concrete elements including the columns, decks or precast segments etc.

# CONCRETE DAMAGE AND DETERIORATION

The root causes



## Steel Reinforcement Corrosion

Root Cause: (Examples)

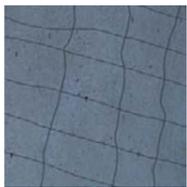
- Chloride ingress
- Carbonated concrete
- Stray electrical current



## Leaching/Efflorescence

Root Cause: (Examples)

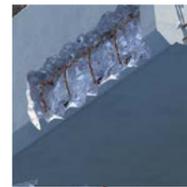
- Water ingress



## Non-Structural Cracks

Root Cause: (Examples)

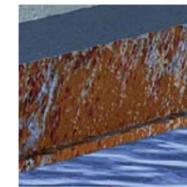
- Shrinkage
- Thermal movement
- Alkali Aggregate Reaction (AAR)



## Concrete Spalling

Root Cause: (Examples)

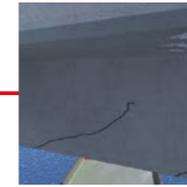
- Steel reinforcement corrosion
- Freeze/Thaw action
- Impact



## Steel Corrosion

Root Cause: (Examples)

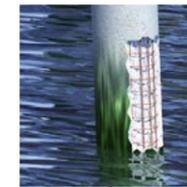
- Inadequate steel coatings
- Chloride ingress
- Water ingress



## Structural Cracks

Root Cause: (Examples)

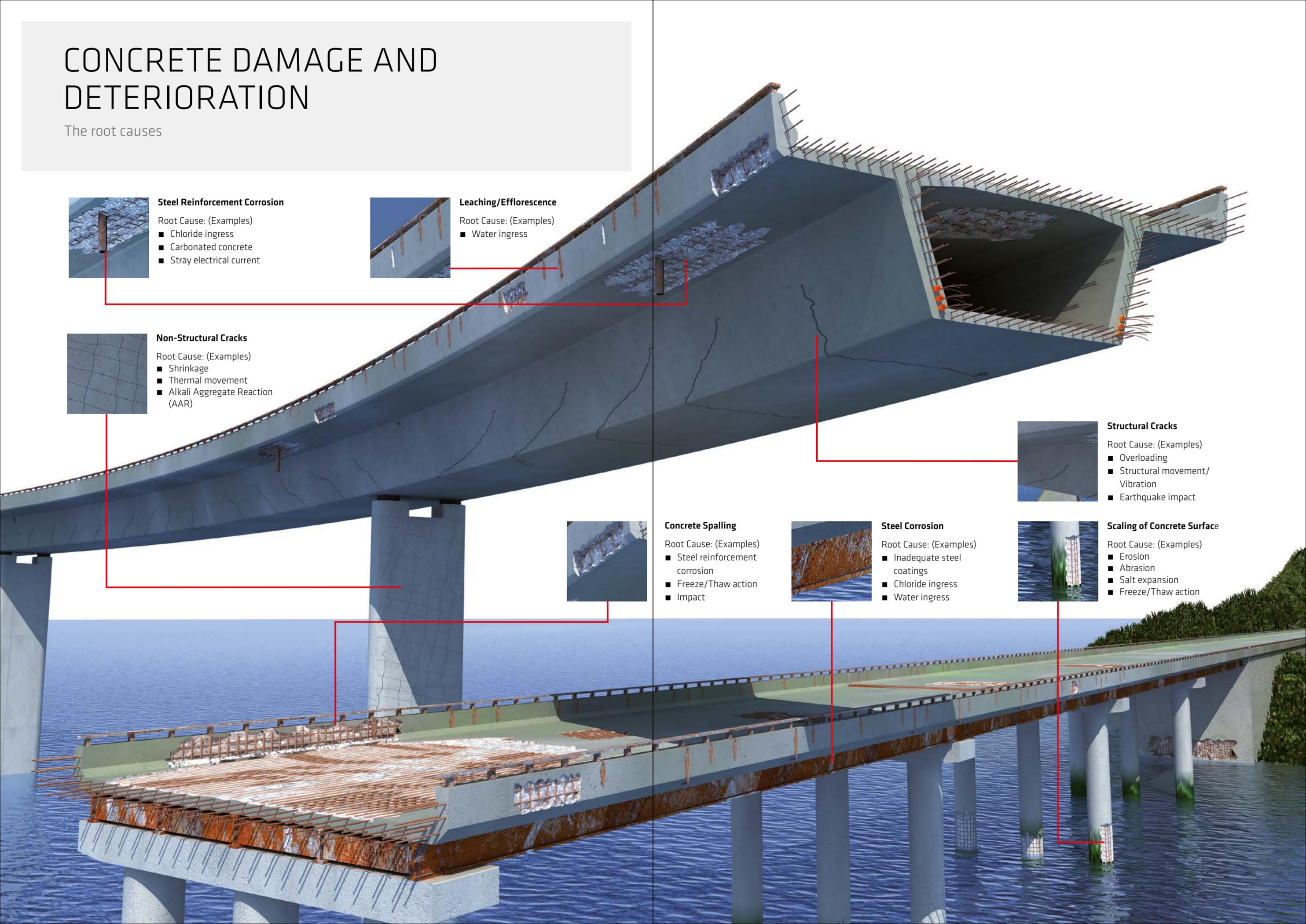
- Overloading
- Structural movement/Vibration
- Earthquake impact



## Scaling of Concrete Surface

Root Cause: (Examples)

- Erosion
- Abrasion
- Salt expansion
- Freeze/Thaw action



# GENERAL BRIDGE REFURBISHMENT CONSIDERATIONS

Before defining the repair and protection strategy including detailed refurbishment procedure, the specific bridge project related refurbishment requirements must be considered. These requirements can have an important influence in determining the correct design, planning and construction procedures, together with the future maintenance works necessary for the bridge. Examples of these project related requirements are outlined below.

## Durability

Remedial works on a bridge structure can have a significant cost; hence the frequency of these works should be as far apart as possible. Therefore the products used in bridge remedial works must provide adequate durability to extend the frequency to the defined service life.



## Total Life Cycle Costing

The total costs must take into account the actual costs of the re-medial works plus the maintenance costs of the defined service life. This significantly influences the selection of the appropriate refurbishment concept and the specific materials to be used.



## Duration of Closure

The time for the bridge or lane closure has a direct influence on the cost of remedial works. The choice for the selection of repair and protection systems must allow a fast return to service and therefore reduce the disruption of traffic to a minimum.



## Exposures / Site Conditions

The specific site exposure and environmental conditions, such as the climate, access and space for materials application, also significantly influences the selection of the refurbishment concept and/or the appropriate materials and application techniques.



## Aesthetic Issues

Concrete bridges are often built with innovative designs and can become well known landmarks in a region. Therefore the aesthetic considerations can often also play an important role in the design and execution of bridge remedial works.



## Trafficking

To minimise traffic disruption long periods of remedial works have to be prevented. Repairs also have to be done under live traffic loading. This requires special materials and only systems which are specifically tested to be suitable for application under dynamic load will achieve the required quality and durability.



## System Compatibility

Remedial work on complex bridge structures often demands a complete and integrated system buildup. It is very important that all of the products used are compatible. The use of one full range system supplier with proven compatible products and systems ensures that this is achieved.



## Ecology

Environmental friendly and sustainable materials such as solvent free products help to safeguard the environment. These are increasingly an important requirement and in some countries, additional taxes now have to be paid for products that release Volatile Organic Compounds (VOC's).



# GENERAL BRIDGE REFURBISHMENT PROCEDURES

The repair and protection of reinforced concrete bridges must always be executed according to all relevant local Standards and Regulations. After a detailed condition survey and root cause analysis, the right procedures for successful refurbishment can be defined. Standards (such as European Standard EN 1504-9) define Principles and Methods to be refurbish damaged concrete. Please refer to our Brochure 'The Repair and Protection of Reinforced Concrete with Sika' for more information relating to repair and protection according to EN 1504-9.

Types of Damage / Defects (Examples)		Possible Principles / Methods	
		For the Repair	For the Protection
Concrete Spalling / Scaling of Concrete Surface		<ul style="list-style-type: none"> <li>Concrete Restoration (Method 3.1 / 3.3)</li> </ul>	<ul style="list-style-type: none"> <li>Protection against Ingress (Methods 1.1 / 1.2 / 1.3)</li> <li>Physical Resistance (Method 5.1 / 5.2 / 5.3)</li> </ul>
Steel Reinforcement Corrosion		<ul style="list-style-type: none"> <li>Restoring passivity (Method 7.2)</li> </ul>	<ul style="list-style-type: none"> <li>Increasing resistivity (Method 8.1 / 8.2 / 8.3)</li> <li>Cathodic Control (Method 9.1)</li> <li>Cathodic Protection (Method 10.1)</li> <li>Control of anodic areas (Methods 11.1 / 11.2 / 11.3)</li> </ul>
Structural Cracks		<ul style="list-style-type: none"> <li>Concrete Restoration (Methods 3.1 / 3.3)</li> <li>Crack Injection (Methods 4.5 / 4.6)</li> </ul>	<ul style="list-style-type: none"> <li>Structural Strengthening (Methods 4.1 / 4.3 / 4.4 / 4.7)</li> </ul>
Non-Structural Cracks		<ul style="list-style-type: none"> <li>Filling of cracks (Method 1.5)</li> </ul>	<ul style="list-style-type: none"> <li>Protection against Ingress (Method 1.1 / 1.2 / 1.3)</li> <li>Moisture Control (Method 2.1 / 2.2 / 2.3)</li> <li>Physical Resistance (Methods 5.1 / 5.2 / 5.3)</li> </ul>
Leaching / Efflorescence		<ul style="list-style-type: none"> <li>Filling of cracks (Method 1.5)</li> </ul>	<ul style="list-style-type: none"> <li>Protection against Ingress (Method 1.1 - 1.8)</li> <li>Moisture Control (Methods 2.1 / 2.2 / 2.3)</li> </ul>
Structural Steel Corrosion		<ul style="list-style-type: none"> <li>(None)</li> </ul>	<ul style="list-style-type: none"> <li>ISO 12944 Refers to the Corrosion Protection of Steel Structures</li> </ul>

# SIKA - YOUR COMPLETE SYSTEM SUPPLIER

## SIKA IS A GLOBAL MARKET AND TECHNOLOGY LEADER IN SPECIALIST CONSTRUCTION CHEMICALS

such as bridge refurbishment products. We have manufacturing facilities worldwide and regional subsidiaries in over 70 countries. Our extensive experience and expertise have been gained from the past 100 years of working on the refurbishment of reinforced concrete bridges and other civil engineering structures.

Sika today provides a complete range of innovative products and systems especially designed to solve all of the challenging requirements and situations in the differing specific bridge refurbishment project requirements and site conditions anywhere in the world.

### EXAMPLES OF SIKA'S LEADING INNOVATIONS FOR BRIDGE REFURBISHMENT PROJECTS

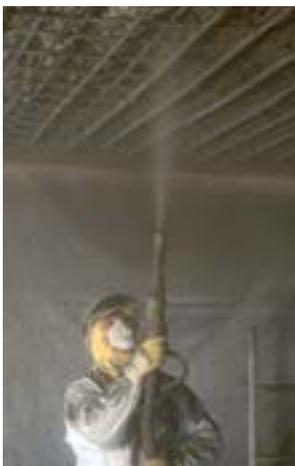
**Concrete Admixtures** - For durable concrete mix design and placing.



**Watertight Joint Systems**  
- For watertight sealing of all types of movement and construction joints.



**Liquid Applied Waterproofing Membrane**  
- For durable crack-bridging protection of bridge decks.



**Concrete Repair Systems**  
- For secure concrete repair works even under dynamic loading.



**Corrosion Management Systems** - Protecting embedded steel reinforcement without changing the concrete appearance



**Post-tensioning Systems** - For highly efficient structural strengthening of reinforced concrete bridges.

# THE “ADDED VALUES” FROM SIKA

## **SIKA PROVIDES FULL SUPPORT TO BRIDGE OWNERS, DESIGNERS AND CONTRACTORS WITH THE NECESSARY TECHNICAL ADVICE AND ASSISTANCE** to ensure a successful project. This includes

assistance in every step of the refurbishment process, from the initial condition survey and assessment, the root cause diagnosis, specification writing, detailing, method statements, on site quality control and practical application assistance.

Sika's expertise can make a significant contribution in minimizing the total project cost over the full defined service life-cycle. Additionally this expertise and our local presence globally, means that our clients and their customers has technical support to solve their specific problems, whether in the design office or on site.

### **EXAMPLES OF OUR CAPABILITIES**



Sika's experience – continually developed since 1910.



Sika's expertise and competence – all over the world.



Sika's complete system compatibility – reliably proven and tested.



Sika guarantees – for a reliable partnership.



Sika's innovative solutions and systems – for durable bridge structures.



Sika's full project support – from design to completion, through all project phases.



Sika's complete product range – all solutions from one single-source supplier.



Sika's application engineering – for the most efficient and cost effective application.



Filled "Baenziger Block" with crack sensitive Mortar

Sika's additional testing developments – for totally reliable products and systems.

# SIKA SOLUTIONS FOR CONCRETE REPAIR

**OVERVIEW** Repairing damaged concrete is one of the primary requirements in the maintenance of concrete bridges. Localized spalling or full surface scaling of concrete surfaces has to be repaired with durable concrete repair materials. A sound and correctly repaired concrete substrate is also the basic requirement for any additional waterproofing, protection or strengthening systems to be applied.



## Requirements

- Full system compatibility (bonding bridge, repair mortar, levelling mortar)
- Approved for structural repairs where required (e.g. class R3 or R4 according EN 1504-3)
- Low crack sensitivity
- Fast and easy application

## Sika Concrete Repair Expertise

Sika provides an extensive range of thoroughly tested and proven repair materials and systems based on different technologies for each specific requirement and situation. These include bonding and corrosion protection primers, hand and machine applied repair mortars, suitable for vertical and overhead application, semi-fluid mortars for efficient bridge deck repairs, plus combined surface levelling and protection mortars, not requiring additional protective treatments (EpoCem®-technology).

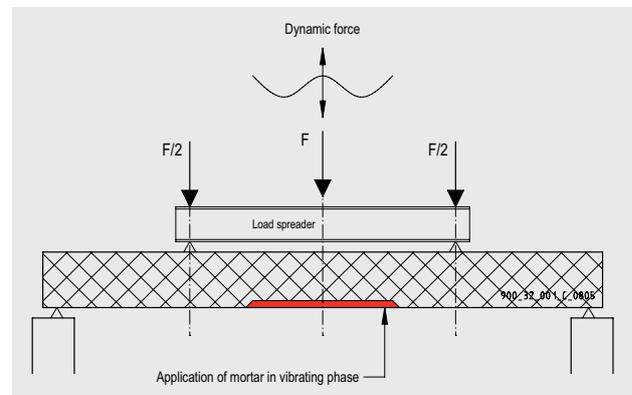
## ADDED VALUE FROM SIKA IN CONCRETE REPAIRS

### Time Saving in Surface Preparation

Sika's tested and unique Sikafloor EpoCem® technology for fast bridge deck repairs and short waiting time for application of waterproofing systems

### Advantages:

- Reducing the waiting times required before applying bridge deck waterproofing
- For reduced substrate preparation because of better bonding due to epoxy resin



### Sika Solutions for Horizontal Repair Works

Thin-layer repair system for bridge decks:

- Bonding bridge primer for large area repairs (where relevant)
  - SikaTop® Armatec®-110 EpoCem® or - Sika® MonoTop®-610
- Thixotropic repair mortars for local patch repairs
  - Sika® MonoTop®-612
- Self-levelling, epoxy modified, cement based levelling mortars
  - Sikafloor®-81 EpoCem®
- Pourable concrete
  - Sika® Armorcrete
- Fast setting repair mortars
  - Sika® Rapid Repair Mortar or Sikaset® 45



### Sika Solutions for Vertical Repair Works

Structural concrete repair system for columns and beams:

- Bonding primer (where relevant)
  - Sika® MonoTop®-610 N or SikaTop® Armatec-110 EpoCem®
- Hand or wet spray machine applied repair mortars
  - Sika® MonoTop®-612 /-615
- Surface levelling and fairing mortars
  - Sikagard®-720 EpoCem®
- Hand or machine applied repair mortar
  - Sika® MonoTop®-612
- Dry spray machine applied
  - SikaCem® 133 Gunit



### Sika Solutions for Overhead Repair Works

Structural concrete repair systems for soffits and other surfaces under live dynamic loading:

- Bonding bridge primer
  - SikaTop® Armatec®-110 EpoCem®
- Hand or machine applied repair mortar
  - Sika® MonoTop®-612
- Surface levelling mortar
  - Sika® MonoTop®-620
- Dry spray machine applied
  - SikaCem®-133 Gunit



# SIKA SOLUTIONS FOR STRUCTURAL STRENGTHENING

**OVERVIEW** If the existing steel reinforcement is reduced in capacity due to corrosion, if the traffic loads are increased (i.e. permissible axle weights), or if the structural design or seismic resistance needs improvement, then reinforced concrete bridges have to be strengthened. or strengthening systems to be applied.



## Requirements

- High tensile resistance or high modulus of elasticity to reinforce and upgrade the structurally deficient beams, slabs, columns, etc.
- Easy to install and corrosion resistant materials for exposed environments
- Fast application to reduce traffic closure times

## Sika in Structural Strengthening

Sika has been involved in structural strengthening since the development of the technology in the 1960's using bonded steel plates. Since 1991 Sika has also been a pioneer with the development of carbon fibre reinforced polymers based structural strengthening systems. As the clear worldwide leader in the structural strengthening of all types of reinforced concrete structures, Sika provides a full range of fully tested and approved strengthening systems.

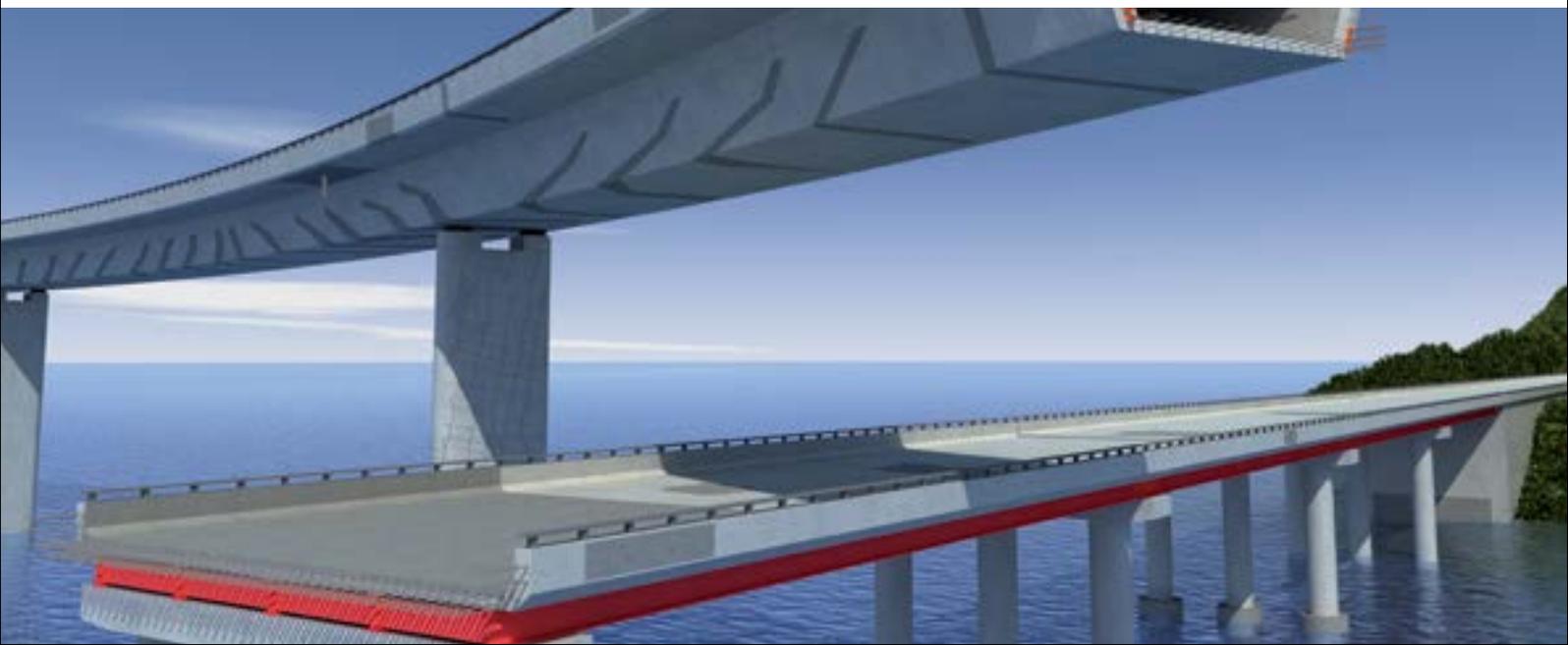
## ADDED VALUE FROM SIKA IN STRUCTURAL STRENGTHENING

### Sika® CarboDur® Heating Device

Accelerated adhesive curing in low temperatures or to reduce closure times, using the innovative electrical heating equipment – Sika® CarboHeater

### Advantages:

- Fast curing of the structural adhesive to reduce closures or time on site
- Allows application of Sika® CarboDur® strengthening systems at lower temperatures (e.g. in winter)
- Allows application of the Sika strengthening systems under live dynamic load
- Allows the Sika Strengthening systems to be used in increased service temperatures (in conjunction with Sikadur®-30)



### Sika Solutions for Flexural Strengthening

Structural strengthening systems for the flexural strengthening of bridge decks, consisting of Sikadur® structural epoxy adhesives and:

- The carbon fibre reinforced polymer based, pultruded plate system
  - Sika® CarboDur®
- The post-tensioning system for structural strengthening
  - Sika® CarboStress®
- Ultra high modulus plates for cast iron structures
  - Sika® Bespoke UHM Plates



### Sika Solutions for Shear Strengthening

Strengthening systems for the shear strengthening of beams and columns, consisting of Sikadur® structural epoxy adhesives and:

- Prefabricated L-shape plates - Sika® CarboShear® L for application on beams
- Uni- or bi-directional SikaWrap® fabric strengthening systems based on carbon fibre, For application on beams and columns



### Sika Solutions for Axial Strengthening

Strengthening systems for the axial strengthening of columns, consisting of Sikadur® epoxy adhesives and:

- Uni- or bi-directional SikaWrap® fabrics, based on glass or carbon fibres



# SIKA SOLUTIONS FOR WATERPROOFING AND JOINT/CRACK SEALING

**OVERVIEW** To increase the durability of reinforced concrete bridges, all concrete movement and construction joints, plus the bridge decks particularly, have to be waterproofed to prevent serious damage to the concrete, or to the embedded steel reinforcement. Due to dynamic loading, the bridge decks must be protected with elastic, crack-bridging systems, to accommodate any movement and maintain the protection.



## Requirements

- Elastic, crack-bridging properties, especially at low temperatures
- Resistance to chlorides and automotive chemicals such as fuel, oils and hydraulic fluids
- Easy to install and accommodate variations in level and substrate conditions
- Fast application to reduce traffic closure times

## Sika in Waterproofing

Sika provides a full range of waterproof sealing products and systems for reinforced concrete bridges. These include watertight solutions for all types of joints, crack injection systems and bridge deck waterproofing solutions to solve each specific type of problem. Sika supports the contracting customers and their clients with unique service and support in these areas including inspection, specification writing, detailing, full on-site support etc..

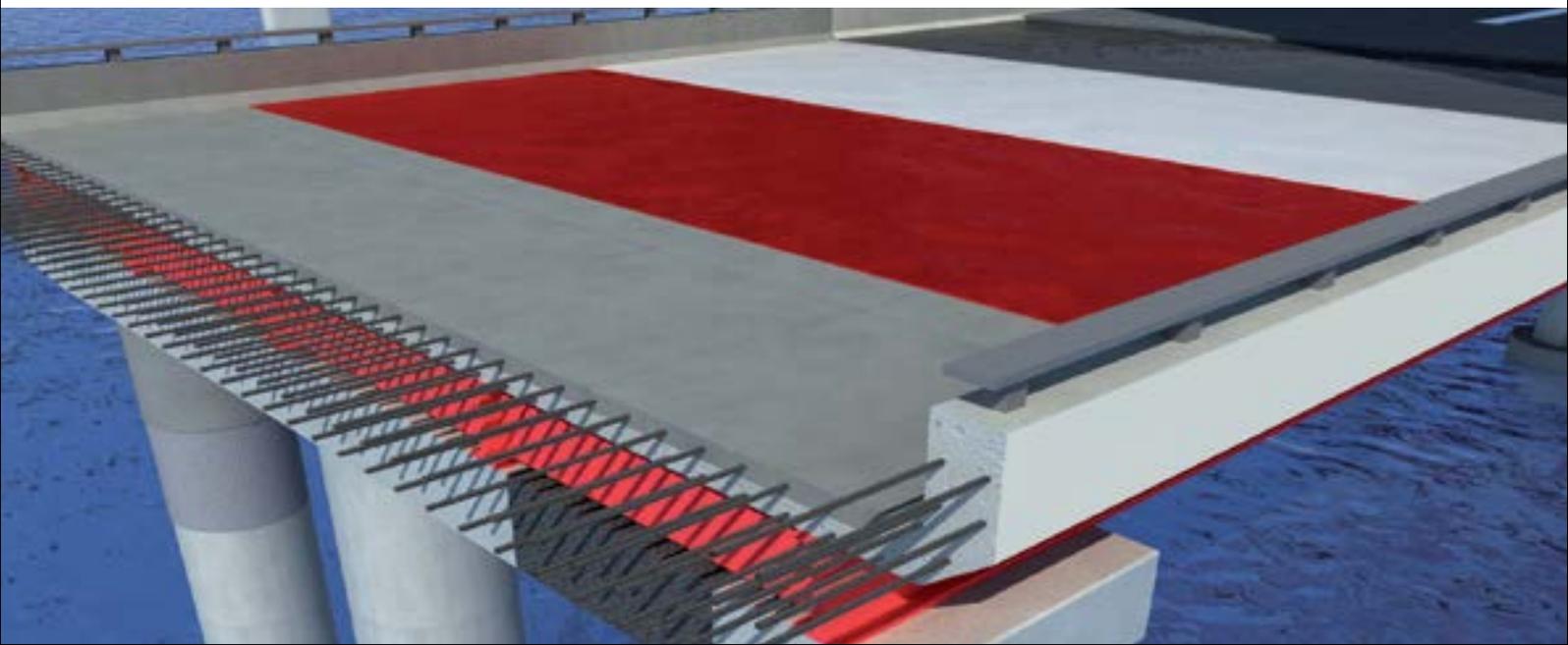
## ADDED VALUE FROM SIKA IN BRIDGE DECK WATERPROOFING

### Adhesion Promoter for Asphalt Toppings

Sika adhesion promoting systems for asphalt toppings on the waterproofed bridge decks using either Sikalastic® adhesion promoter pellets or Sikalastic® adhesive primer.

### Advantages:

- High shear transfer loading
- Easy to apply
- Full bond system



### Sika Solutions for Bridge Deck Waterproofing

Durable waterproofing systems for concrete bridge decks:

- For concrete bridge decks under asphalt, hot spray polyurethane Sikalastic® membrane systems



### Sika Solutions for Elastic Joint Sealing

High Performance watertight joint sealing systems for use on bridge decks, parapets and other elements:

- For facade and parapet joint waterproofing: Sikadur® Combiflex® SG system
- For facade joint waterproofing: Sikaflex® joint sealants



### Sika Solutions for Waterproofing Cracks

Structural bonding and flexible watertight injection systems for crack sealing in concrete structures:

- For the surface sealing of bridge decks: Flexible polyurethane and acrylic resin based injection systems – Sika® Injection® systems
- For structural cracks and void repair: Sikadur® and Sika® Injection® low viscosity, epoxy resin based systems



# SIKA SOLUTIONS FOR CONCRETE PROTECTION

**OVERVIEW** To improve the performance and durability of reinforced concrete surfaces on bridge structures, additional protection systems are frequently required, particularly in refurbishment situations. Typical concrete protection systems for bridges can be classified as hydrophobic impregnations, sealing impregnations, surface coatings, or corrosion inhibitors. These are designed for use in different situations or collectively in alternative combinations, to greatly reduce damage to the concrete surfaces and to stop or significantly reduce the rate of steel reinforcement corrosion. Thus preventing the even more significant structural damage, that would otherwise occur.



## Requirements

- Protection against ingress of water, chloride and carbon dioxide
- High resistance against UV radiation
- Resistance against frost and wide temperature variations

## Sika in Concrete Protection

Sika provides a wide range of tested and well proven concrete protection systems based on different technologies including hydrophobic impregnations, impregnations, rigid and elastic surface coatings, plus surface applied corrosion inhibitors. All of these Sika products and systems fully comply with various standards and regulations.

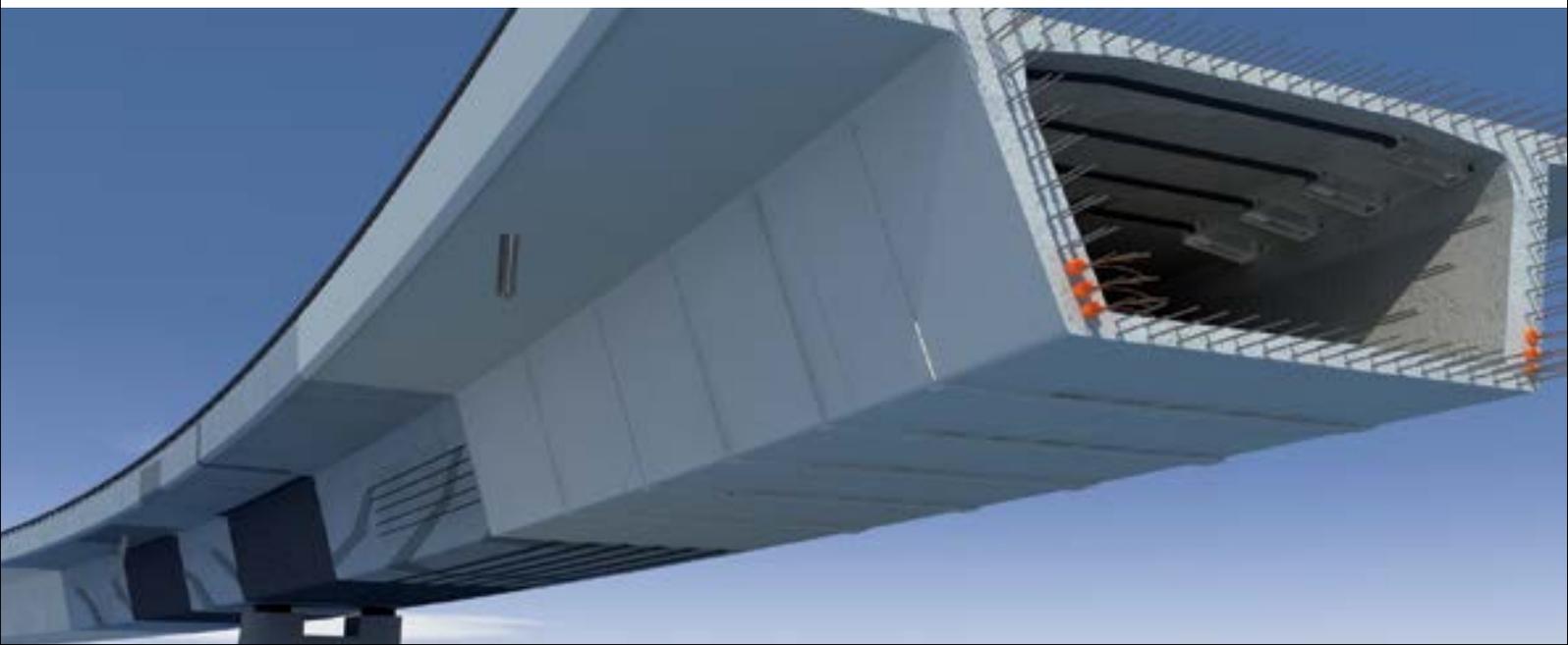
## ADDED VALUE FROM SIKA IN CONCRETE PROTECTION

### Durable and Invisible Protection for Fair-Faced Concrete

The unique and complete concrete protection system, consisting of Sika® FerroGard®-903+ corrosion inhibitor and Sikagard®-700 series hydrophobic impregnations.

### Advantages:

- No change in the structure's appearance
- Dual protection behaviour – for steel reinforcement and concrete surfaces
- Cost effective solutions
- Fast and easy to apply



### Sika Solutions for Total Corrosion Management

- Liquid, surface applied corrosion inhibitor
  - Sika® FerroGard®-903+
- Galvanic and Impressed current protection systems
  - Sika® anodes



### Sika Solutions for Fair Faced Concrete

Durable, deep penetrating, protective hydrophobic impregnations for facades, beams, columns and all areas of the bridge superstructure:

- Silane based products
  - Sikagard®-706 Thixo /-705 L /-740 W
- Silane/Siloxane combination based product
  - Sikagard®-700 S



### Sika Solutions for Protecting Concrete

Rigid, continuous film-forming, protective concrete surface coatings:

- High performance, acrylic resin based coating
  - Sikagard®-680 S
- Water dispersed, protective acrylic resin based coating
  - Sikagard®-670 W /-675 W ElastoColor®



### Sika Solutions for Cracking Concrete

High build, film-forming protective concrete coating system with crack-bridging abilities:

- Water dispersed, high build, acrylic resin based, elastic intermediate and surface levelling coating
  - Sikagard®-545 W Elastofill®
- Water based, high build, elastic crack-bridging, coloured, protective top-coating
  - Sikagard®-550 W Elastic



# SIKA SOLUTIONS FOR GROUTING AND FIXING WORKS

**OVERVIEW** Remedial works on concrete bridge structures often include the requirement for void filling, fixing and sealing or bedding and grouting with free flowing materials. Typical examples are concrete repairs using formwork, high precision grouting under bridge bearing plates, or for cable duct grouting. Additionally flowable resin and cement grouts are used to fix manholes or other steel frames and equipment, where rapid hardening materials are usually required to reduce closure times.

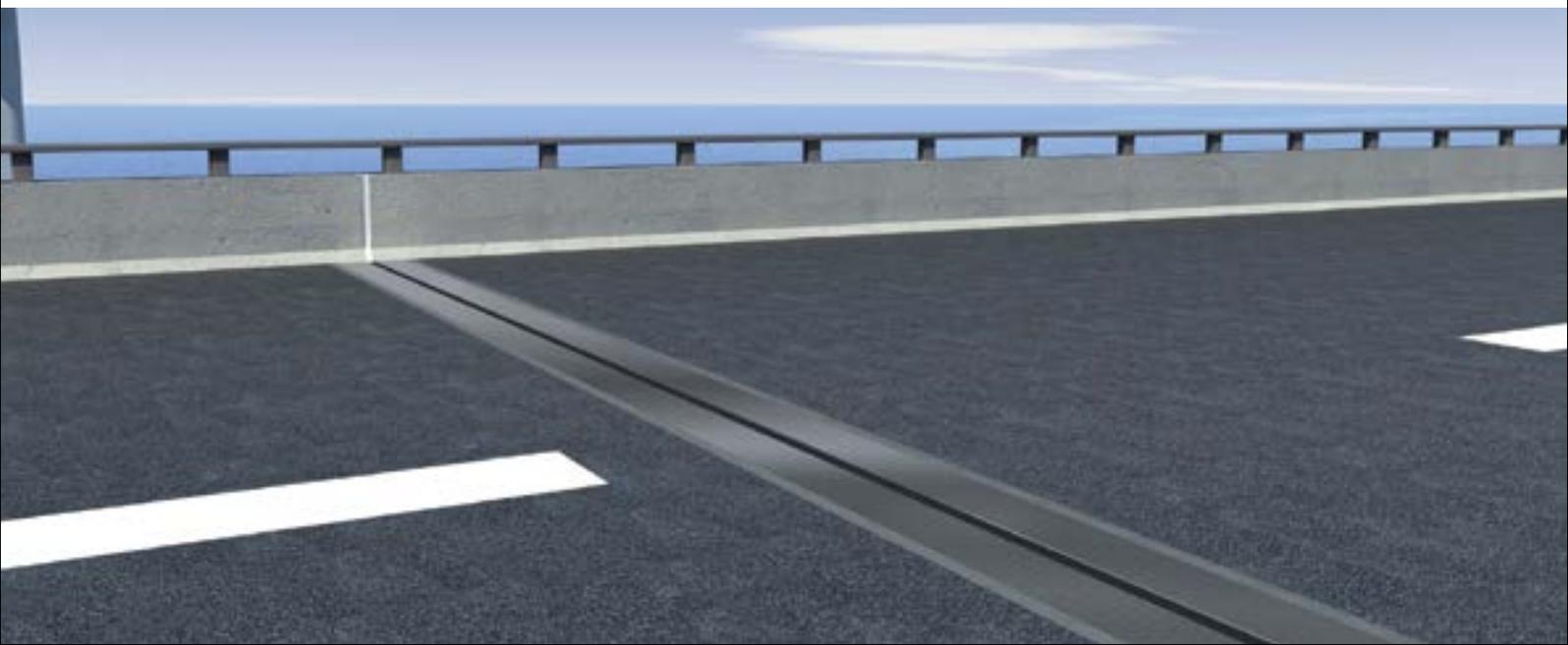


## Requirements

- High strengths and low creep under permanent load
- Low shrinkage and reduced tendency to cracking
- Excellent flow characteristics
- Easy handling and application
- Fast application and hardening

## Sika in Grouting and Fixing

Sika provides a wide range of tested and well proven grouts and fixing materials based on all of the different technologies available including cement, epoxy, polyurethane and PMMA. For many decades, Sika has also provided special products for high precision applications such as bearing plates, rail tracks and duct sealing.



### Sika Solutions for Structural Grouting

Materials for grouting under bridge bearing plates and to fill voids, holes and cavities or for embedding drainage pipes and other elements:

- Cement based, high precision grouting products
  - SikaGrout®-212 and Sika® L2 Highflow
- Epoxy resin based, rapid hardening, high strength grouting products for use under dynamic loading
  - Sikadur®-42



### Sika Solutions for Rail and Base Plates

Rail fixing, damping and bedding solutions for all types of rail track systems to be installed on bridge decks:

- Discrete fixing solutions
  - Icosit® KC range
- Direct rail track fixing and bedding solutions
  - Icosit® KC range



# SIKA SOLUTIONS FOR STEEL CORROSION AND FIRE PROTECTION

**OVERVIEW** Structural steel is also widely used around the world for the construction of bridges and bridge components including the superstructure, parapet railings, decks and cables. The corrosion protection of this steel is therefore essential to increase the durability and sustainability of the structure. Chlorides and condensed water can accelerate the steel corrosion process and must be kept away from the steel surfaces.



## Requirements

- Corrosion protection in accordance with EN ISO 12944
- UV and weathering resistance
- Coating system service life of 20 - 25 years to reduce maintenance / closures
- Fulfil high aesthetic demands in appearance
- Low VOC emissions
- Fast curing / short inter-coat waiting times
- Elastic behaviour (systems for steel cable protection particularly)

## Sika in Steel Corrosion Protection

Sika provides a wide range of tested and approved steel protection systems based on the latest technologies and our long-term experience with steel coatings. Sika produces the most advanced protective coating systems for bridges, designed to be selected in accordance with international standard EN ISO 12944, which ensures the defined service life to the first maintenance and the sustainability is assured.



### Sika Solutions for Shop and Site Applications

Protective coating systems for steel maintenance, designed for application on or off site. Specifically formulated for use on non-blast cleaned surfaces, suitable for use on steel surfaces that are site prepared mechanically with power tools:

- Sika® Poxicolor® Primer HE NEW followed by SikaCor® EG 120
- Tested and approved in accordance with EN ISO 12944 part 5  
Designed for shop application with the three layer system build-up, possible in a single day:
- High-performance and long-term steel corrosion protection with the SikaCor® EG -Rapid System
- Tested and approved in accordance with TL/TP-KOR page 97 and EN ISO 12944 part 5



### Sika Solution for Fire Protection

A unique fire protection system especially designed for the protection of structural steelwork lasting from 30 minutes and is suitable for both interior and exterior use. This intumescent coating expands in fire situations to create an air filled insulation layer against the high temperatures:

- Sika® Unitherm Platinum
- Tested and approved in accordance with EN 13381-8 and BS 476 part 20-22



# SIKA SOLUTIONS FOR STRUCTURAL BONDING WORKS

**OVERVIEW** Structural adhesives are used for many bonding applications in new construction and refurbishment. The bond must allow the transfer of high loads without deformation and creep. The main function of structural adhesives is in the bonding of similar or dissimilar materials together (i.e. concrete to steel, steel to composites etc). Dependent on their design, structural adhesives can not only bond the elements together, but they can also fulfil additional functions such as waterproofing, sealing, concrete protection or even vibration dampening.



## Requirements

- Good creep resistance
- Uniform and direct load transmission
- Resistant and able to accommodate dynamic loading
- Good ageing resistance

## Sika in Structural Bonding

Sika has been a pioneer in the use of resin adhesives for structural bonding of precast concrete elements since the 1960's. Sika's epoxy adhesives have now been used to bond segmental bridge structures all around the world. This extensive experience has allowed the development of a wide range of additional structural bonding products and systems for unique applications. In the 1990's Sika also introduced a complete range of cartridge applied resin anchoring adhesives for many different applications.

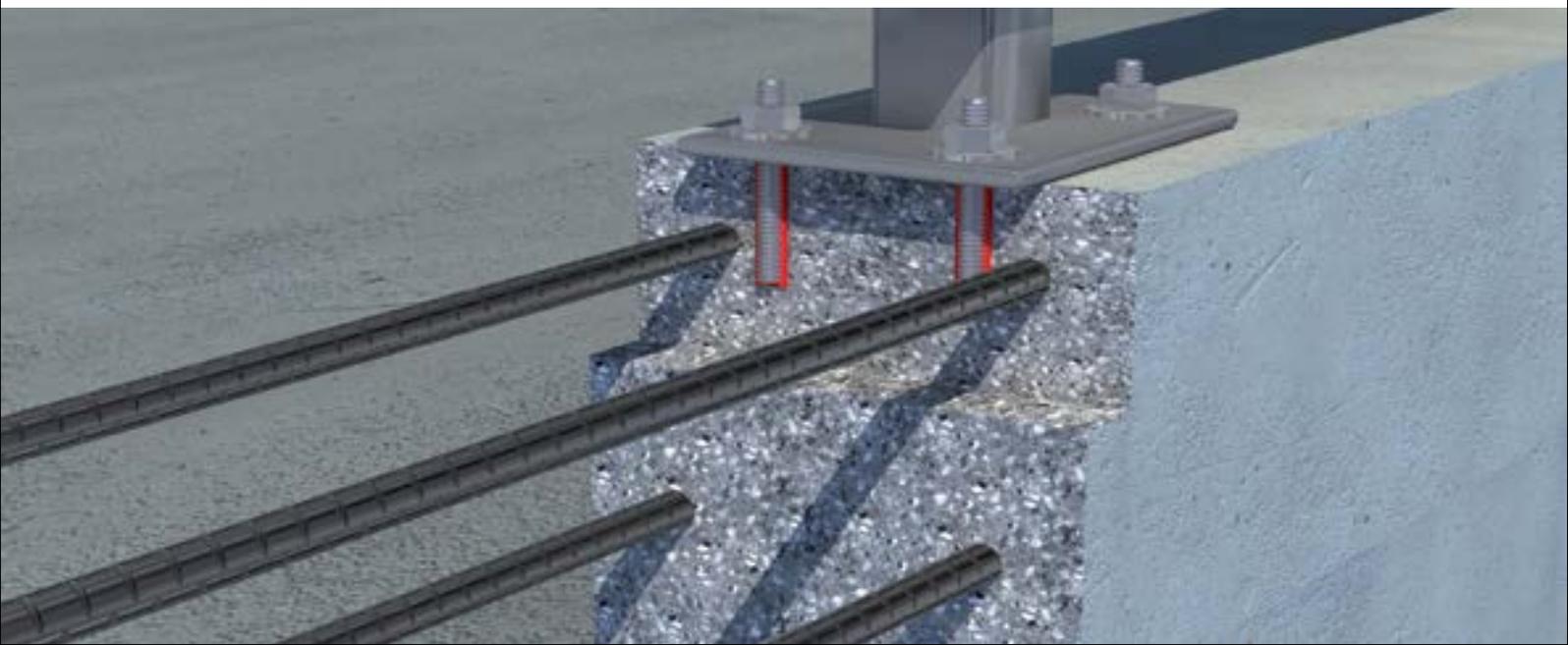
## ADDED VALUE FROM SIKA IN STRUCTURAL BONDING

### Structural Bonding of Ultra High Performance Concrete (UHPC)

Sikadur®-30 epoxy adhesive for the structural bonding of Ultra High Performance Concrete (UHPC) precast elements

#### Advantages:

- High mechanical strengths
- Good creep behaviour
- No shrinkage
- High durability, even at high temperatures and high humidity
- Resistant to freeze/thaw exposure
- High fatigue resistance under dynamic load
- High abrasion, shock and impact resistance
- Good chemical resistance (including to oils and de-icing salts etc.)



### Sika Solutions for Rigid Structural Bonding

Epoxy adhesives for bonding different elements or components to concrete, steel or bituminous substrate:

- Sikadur®-30 for high-performance bonding of steel plates on to concrete
- Sikadur®-31 CF for multi-purpose bonding such as precast concrete or natural stone kerbs onto concrete or asphalt surfaces



### Sika Solutions for Structural Anchoring

Special structural adhesives for anchoring all types of fittings and equipment to bridge structures such as for the installation of cable trays or other services, crash barriers, drainage pipes, inspection access equipment, catch nets, etc.:

- ETAC approved, structural resin anchoring adhesive Sika® AnchorFix®-2, for the installation of threaded rods and steel dowel bars at temperatures as low as -5 °C.
- High performance, epoxy resin based, anchoring adhesive Sika® AnchorFix®-3+, for secure structural installations, even into damp substrates



### Sika Solutions for Steel Fixtures and Fittings

Special epoxy mortars for the bedding, bonding and dry-packing of many different types of fixtures and fittings, including steel frames and parapet railings, etc.:

- 3-component, non-shrink, epoxy resin based mortars Sikadur®-41 CF
- Cementitious grouts
  - Sikagrout® 212 and Sika® L2 High Flow



# SIKA FULL RANGE SOLUTIONS FOR CONSTRUCTION:



**WATERPROOFING**



**CONCRETE**



**REFURBISHMENT**



**MERCHANT**



**SEALING AND BONDING**



**FLOORING**



**ROOFING**



**INDUSTRY**

## FOR MORE INFORMATION:



### 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.



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EMS 45308



OHS 585274

### SIKA LIMITED

Head Office  
Watchmead, Welwyn Garden City  
Hertfordshire, AL7 1BQ  
United Kingdom

### Contact

Phone +44 1 707 394444  
Fax +44 1 707 329129  
E-Mail enquiries@uk.sika.com  
www.sika.co.uk

### SIKA IRELAND LIMITED

Sika House  
Ballymun Industrial Estate  
Ballymun, Dublin 11  
Ireland

### Contact

Phone +353 1 862 0709  
Fax +353 1 862 0707  
E-Mail info@ie.sika.com  
www.sika.ie

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