SIKA® PARKING CAPABILITIES
SYSTEMS AND SOLUTIONS

BUILDING TRUST

ROOT CAUSES OF DAMAGE

To avoid reoccurrence of damage to any reinforced concrete structure, it is essential that the root cause and extent of all defects are clearly understood.

If repairs, such as patching, crack injection, application of sealant, coatings, or deck membranes are performed without this understanding, (usually involving an experienced consultant), the result will be a repeated failure in either the same or adjacent locations.

PROBLEM:

Extreme chloride-induced corrosion damage in parking stall areas.

POSSIBLE CAUSES:

- Original improper concrete mix design
- Inadequate cover of concrete over reinforcing steel
- Open construction joints or original shrinkage cracks
- Defective movement joints
- Unsealed decks

PROBLEM:

Severe and dangerous delamination of soffits due to the leakage of deicing salts through the deck.

POSSIBLE CAUSES:

- Carbonation induced corrosion due to insufficient concrete cover
- Steel corrosion due to chloride ingress. As the steel corrodes, it expands causing cracking of the concrete which leads to spalling

PROBLEM:

Spalling of concrete over reinforcing steel.

POSSIBLE CAUSES:

- Original shrinkage cracks in the deck provide a path for chlorides
- Blocked or inadequate drainage
- Absence of, or defects in membranes
- Inadequate movement joints

Severe slab degradation

Chloride-induced corrosion causing spalling of the concrete deck

Corrosion accelerated by carbonation and low cover

INTERPRETING THE RESULTS

Condition Survey of the Structure

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Diagnose the Root Cause and Extent of Damage

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Determine Repair and Protection Objectives

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Select the Appropriate Repair & Protection Strategy

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Define Future Maintenance Requirements & Procedures

Half-cell corrosion potential testing

Once the probable causes of deterioration have been identified, it is essential that a thorough investigation be conducted to determine the existing condition of the parking structure. This appraisal should be carried out by a design professional with specific experience in concrete restoration.

Developing a successful rehabilitation program requires an overall assessment, with the types of distress, and their causes and extent carefully evaluated and understood. Only then can a repair and protection strategy be developed.

Appraisals should include both the topside and underside of decks, columns and beams, as well as all other concrete elements.

FOCUS ON:

- Crack patterns and size
- Previous repair locations
- Spalling concrete
- Delaminating or hollow concrete
- Location of movement joints
- Location of drains
- Ponding of surface water
- Chloride content and depth profile
- Carbonation range and extent
- Depth of concrete cover over rebar
- Concrete permeability
- Petrographic examination of cores (to check for ASR, etc.)
- Condition of waterproofing membranes

CONCRETE REPAIR

SikaTop® AND Sikadur® SYSTEMS

Sika offers a complete range of high performance, premium quality repair mortars for every application from cosmetic to structural repair on parking decks.
Our repair mortars are compatible with Sika repair and protection materials to ensure that both the visual signs of damage and the latent deterioration are addressed, extending the life of the structure.
Sikadur epoxy resin technology include both low modulus and high modulus formulations with viscosity ranges from super low sealer/healers to gel paste anchoring solutions.

Spall repairs on a slab with SikaTop® 122 Plus

Structural cracks injected with Sikadur® resins

SikaTop®, SikaQuick®, SikaRepair®, SikaCem® and Sikacrete®

- Proven excellence over 30 years of on-site performance
- Repair mortars and concretes suitable for application by hand, form and pour/pump, machine spray wet or dry in thickness from 1/8" to full depth
- One and two component polymer modified cementitious mortars
- Unique epoxy/cement reinforcement primer and bonding agent (Sika Armatec 110 EpoCem)
- Available with migrating/penetrating corrosion inhibitor (Sika FerroGard) to reduce incipient anode corrosion ("ring halo" effect) where active chlorides present in the parent concrete accelerate corrosion around the new repair
- Exciting and new pre-packaged, self-consolidating concrete, Sikacrete: a full range of pre-extended concrete materials that eliminate adding stone on the job

Sikadur® STRUCTURAL REPAIR RESINS

- Three decades of proven performance
- 100% solids high or low modulus range of structural bonding and injection resins
- Extended pot life grades for more working times
- Super low viscosity, moisture tolerant epoxy penetrating systems for topical slab protection against chlorides and water penetration

TOTAL CORROSION MANAGEMENT

Total Corrosion Management is a comprehensive approach to addressing any problem caused by corrosion in a parking garage. Because conditions in a parking garage can vary significantly, the best solution may need to vary as well in order to address the range of problems.

Photo courtesy of C-Probe Systems, LTD.

Mayorhold Parking Garage
ICRI Project of the Year 2006

Because chloride contents and active corrosion rates varied by level, Sika FerroGard -903 was used on the upper levels and impressed current cathodic protection was used on the lower levels.

6th Street Parking Garage
ICRI Award of Merit, Parking, 2005

Sika FerroGard-903 was spray-applied to over 100,000 sf of deck surface. Remote, corrosion rate monitoring was installed to monitor the effectiveness of the repair system.

Sika® FerroGard®-903
Surface Applied Corrosion Inhibitor
- Significantly reduces corrosion
- Delays the onset of corrosion
- Economic and easy to apply by roller, brush or spray

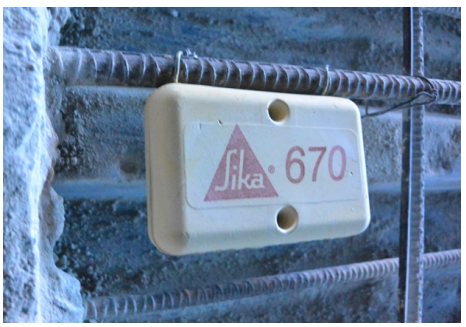
Sika® FerroGard®-908
Dual-funcional corrosion inhibitor and penetrating sealer
- Reduces active corrosion
- Increases resistivity of concrete
- Repels water and chloride ions
- Contains silane sealer and amino alcohol corrosion inhibitor

Sika® FerroGard® 650, 670 AND 675

Sika FerroGard embedded galvanic anodes consist of a zinc core surrounded by a specially formulated cementitious mortar. The zinc core corrodes preferentially to the surrounding rebar it is attached to, providing galvanic protection to the reinforcing steel.

Sika® FerroGard® Anodes
- Corrosion prevention for “ring anodes” adjacent to spall repairs
- Placed at the perimeter of the repair
- Use at the interface of new full-depth slab replacement or partial depth areas
- Highly chloride contaminated concrete

FerroGard Anodes used to prevent corrosion of rebar near the slab edge



FerroGard anodes installed where an existing slab and a new, full-depth slab meet

DECK WATERPROOFING

Sikalastic® AND Sikagard® SYSTEMS

Unprotected concrete decks exposed to rainfall, freeze-thaw, carbonation and deicing salts will deteriorate. "Passive" protection originally provided by the cement paste around the reinforcing steel will progressively be destroyed and unseen corrosion of embedded steel will occur, often resulting in spalls, cracks and leaks.

Sika provides comprehensive solutions to waterproofing problems with maximum protection. Sika's wide range of polyurethanes and epoxies are designed to make concrete and masonry impermeable to water, while offering flexibility to handle all of your parking deck waterproofing needs.

Protection Systems for Parking Decks

Sika Selection Guide

System	Technology	Coats (excluding primer)	Application Days	VOCs	Crack Bridging/Modulus	Features
Sikalastic® 720/745 Traffic	2-component polyurethane	2-3	1-2	below 10	1/16" dynamic	fast cure, low odor
Sikalastic® 390/391/395	2- component polyurethane	2-3	2-3	below 10	1/16" dynamic	low odor
Sikalastic® 710/715/735 AL	1-component polyurethane	3-4	3-4	below 250	1/16" dynamic	no pot life restrictions, enhanced UV stability with aliphatic top coat
Sikalastic® 710 Lo-VOC/715 Lo-VOC /736 AL Lo-VOC	1-component polyurethane	3-4	3-4	below 100	1/16" dynamic	no pot life restrictions, enhanced UV stability with aliphatic top coat
Sikalastic® 22 Lo-Mod Hybrid	polyurethane waterproofing with epoxy wear coat	2-3	2-3	below 10	1/16" dynamic	flexible waterproofing, high abrasion resistance, optional top coat
Sikadur® Epoxy Broadcast Overlay	epoxy	1	1	below 100	low modulus	high abrasion resistance
Sikadur® 55 SLV	low viscosity epoxy	1	1	below 150	high modulus	healer/sealer
Sikagard® 705 L	100% silane sealer	2	1	below 350	not applicable	transparent sealer
Sikagard® 706 Thixo	silane based impregnation cream	1	1	below 350	not applicable	transparent sealer
Sikagard® 740	40% silane sealer	2-3	1	below 350	not applicable	transparent sealer

Sikalastic® 710 Base coat application

Sikalastic® 715 Top coat application

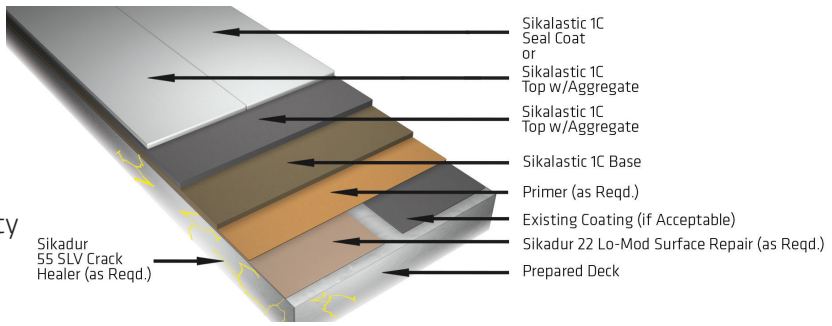
Sikadur® 22 Lo-Mod Overlay

Sikadur® 55 SLV crack healer/sealer

TRAFFIC DECK SOLUTIONS

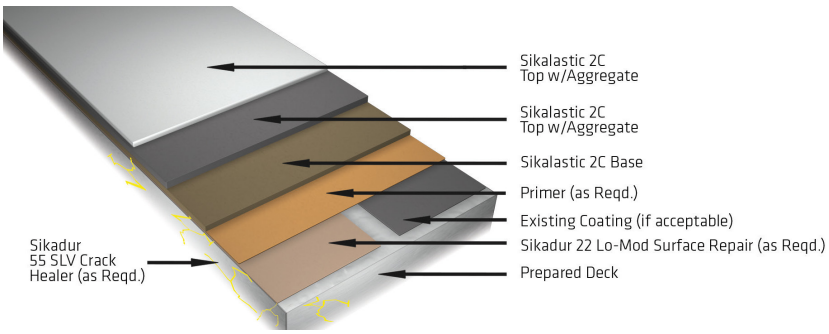
Sikalastic® 710/715 AND 710 Lo-VOC/715 Lo-VOC TRAFFIC SYSTEMS

- Single-component, elastomeric, waterproofing traffic system
- Excellent crack-bridging properties and flexibility even at low temperatures
- Excellent resistance to abrasion and wear
- Impervious to water and deicing salts
- Available aliphatic and top coats



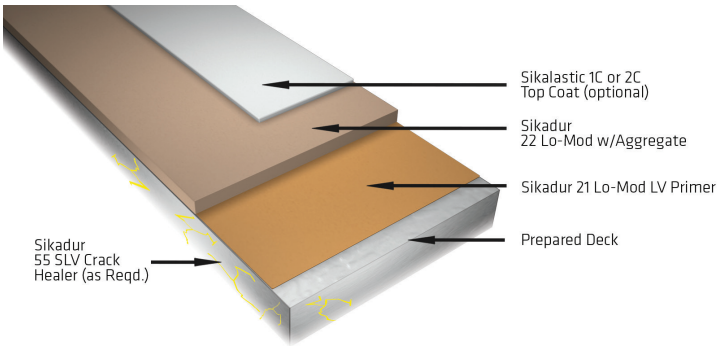
Sikalastic® 720/745 AND 390/391/395 TRAFFIC SYSTEMS

- Two-component, elastomeric, waterproofing traffic system
- Low odor, solvent-free formulation
- Fast turnaround system minimizes downtime
- Excellent crack-bridging properties as well as abrasion and chemical resistance



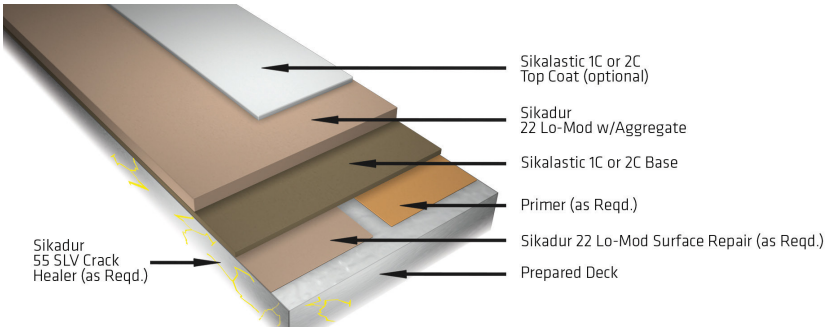
Sikadur® EPOXY BROADCAST OVERLAY SYSTEM

- Two-component, fast curing epoxy protection system
- Superior resistance to abrasion and wear
- Excellent durability
- Optional polyurethane top coats
- Solvent-free, fast turnaround



Sikalastic® 22 LO-MOD HYBRID DECK SYSTEM

- One or two-component, elastomeric, water proofing base coat
- Low odor, solvent free, low VOC, primerless and fast turnaround options
- Low-modulus epoxy-based wear coat
- Full broadcast or seeded aggregate wear coat options



STRUCTURAL STRENGTHENING

Sika® CarboDur® AND SikaWrap® SYSTEMS

Sika CarboDur and SikaWrap are carbon fiber reinforced polymer (CFRP) systems consisting of strips, rods, wraps and accessories for upgrading, repairing and seismically retrofitting concrete structures.

REASONS FOR STRENGTHENING WITH CarboDur® AND SikaWrap® INCLUDE:

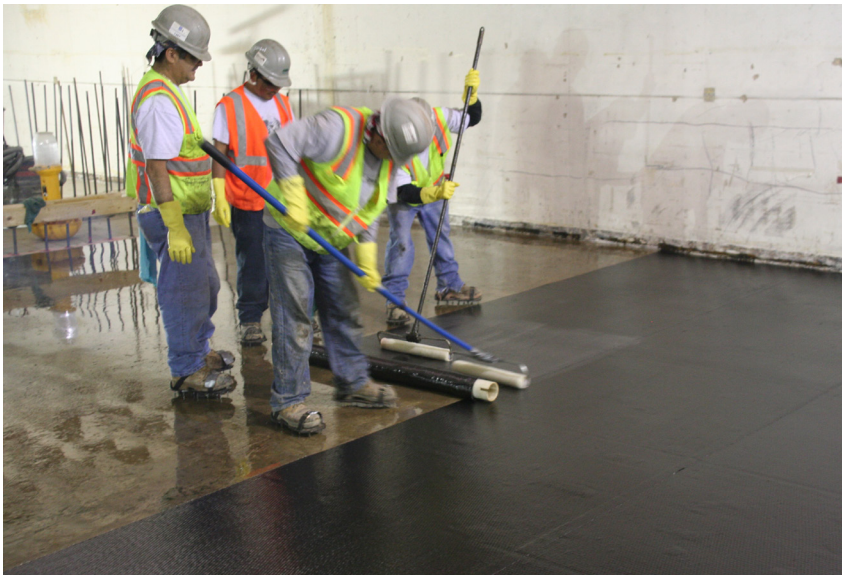
- Changes of use
- Excessive deflection of beams
- Errors in construction or design
- Modifications to structural system
- Increased loading requirements
- Damage from aging and corrosion
- Seismic upgrade
- Vehicle impact
- Structural cracking
- Blast hardening

ADDITIONAL BENEFITS OF STRENGTHENING WITH Sika® CarboDur® AND SikaWrap® SYSTEMS INCLUDE:

- No reduction of headroom
- Speed and simplicity of installation
- Significant reduction of parking downtime
- No changes in structural appearance
- Suitable for application in very confined spaces
- Can be covered with coatings after application
- Can be applied in any length
- Proven technology

Shear strengthening of beam with SikaWrap® fabrics

Flexural strengthening of beam with Sika® CarboDur® strips



SikaWrap® fabrics strengthening a concrete slab

Corbel strengthening with SikaWrap® fabric

Strengthening concrete column with SikaWrap® fabric

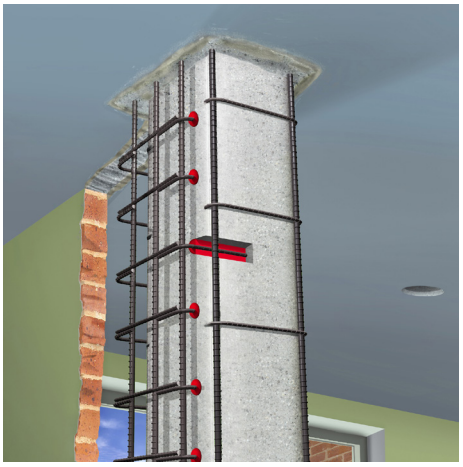
CHEMICAL ANCHORING

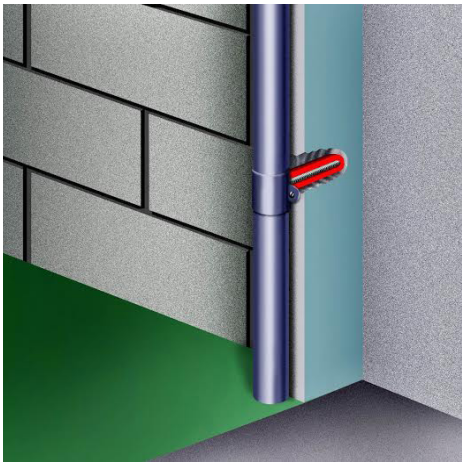
HIGH PERFORMANCE ANCHORING ADHESIVES

CHEMICAL ANCHORING

Sika Corporation has a comprehensive range of anchoring products. For all your chemical anchoring installations on any building structure, this wide range of product offering has a solution that will fit you application requirements. Some of the highlights of this product range are:

- AC-308 Evaluation Reports for cracked and Un-cracked Concrete
- Meets ASTM C 881
- Design software for engineers
- Epoxy and Epoxy Acrylate products - solutions with wide range of chemistries
- Easy to use - Does not require special tools





AnchorFix® RANGE OVERVIEW

Sika Anchorfix Product	Cartridge Sizes (ml)	Approvals	Non-cracked Concrete	Cracked Concrete	Selsmic	Threaded Rod	Rebar	Dry Concrete	Damp Concrete
AnchorFix®-3001	250, 600, 1500	ICC ES ESR-3608, NSF-61-9, ASTM C 881	✓	✓	✓	✓	✓	✓	✓
AnchorFix®-2	300, 850	IAPMO UES ER-0306, NSF 61-9	✓			✓		✓	✓
AnchorFix®-500	600, 1500 10 Gal kits	ASTM C 881	✓			✓	✓	✓	
AnchorFix®-2 Arctic	850	ETA	✓			✓	✓	✓	✓
AnchorFix®-1	300	ETA	✓			✓		✓	✓

JOINT SEALING

Sikaflex® & Sikasil® HIGH PERFORMANCE JOINT SEALANTS

Sikaflex® SEALANTS

Sikaflex sealants are a complete range of one component moisture-cure and two component chemical-cure polyurethane sealants for overhead, vertical and horizontal joints. They offer permanent thermal and dynamic movement capability for most joints with elastic durability of up to +100/-50% joint movement.

Sikaflex® 2C NS/SL:

- Two component, 3 day full cure
- Capable of ± 50% joint movement
- Cold weather accelerator available
- Easy to mix, gun and tool

Sikaflex® 2c NS EZ Mix, two component, polyurethane sealant application

OUTSTANDING FEATURES INCLUDE:

- Fast tack-free time
- Extreme tear resistance
- 30 year history of performance
- Compatibility with Sikalastic Traffic and Sikagard Coating Systems
- Elastic durability to below -20°F (-29°C)
- High chemical resistance
- Easy to use

Sikaflex® 2c SL two component, self-leveling sealant applied to joints

Sikasil® SEALANTS

Sikasil sealants are ultra low modulus silicones for sealing joints in concrete parking structures that are excellent for low temperature placement and offer excellent flexibility for dynamic and thermal joint movement

Sikasil® 728 SILICONES:

- Available in one component non sag, self leveling, and a two component, rapid cure self leveling silicone.
- Capable of +100/-50% joint movement capability
- Multiple packaging sizes available

Sikasil®-728 RCS being applied on a bridge deck

CONCRETE PROTECTIVE COATINGS

Criteria	Sikagard®-570	Sikagard®-550 W Elastocolor	Sikagard®-670 W
Chloride resistance	Excellent	Excellent	Excellent
Carbonation resistance	Superior	Superior (tested after 10 years exposure)	Excellent (tested after 10 years exposure)
Crack-bridging capacity	Superior (tested down to 0°C)	Excellent (tested down to 0°C)	Will accept normal hygrothermal movement
Long-term weathering	Superior	Superior	Excellent
Resistance to wind-driven rain	Excellent	Excellent	Excellent
Reinforced	Possible	No	No
Breathability	Yes	Yes	Yes
Aestehtics	Pigmented	Pigmented	Pigmented
Color	463 Standard colors, color matching available	463 Standard colors, color matching available	463 Standard colors, color matching available

CONCRETE PROTECTIVE COATING

The application of Sikagard coatings to concrete surfaces such as walls and the underside of pre cast members and concrete slabs will provide protection from ingress of carbon dioxide, chlorides and other water-borne salts, and provide resistance to weathering, frost and dirt pick-up. Sikagard coatings are not vapor barriers and will allow vapor transmission though the coating. Sikagard coatings provide a uniform silk finish in over 450 standard colors.

Sikagard® 670W anti-carbonation coating applied to underside of slab/ceiling

ADDITIONALLY, Sikagard® COATING SYSTEMS PROVIDE:

- Water based, acrylic, non-toxic, VOC compliant coatings
- Dynamic and thermal crack bridging capabilities does to -25°C
- Excellent resistance to dirt pick-up and mildew
- Proven durability results over 15 years in service periods.
- Exceptional UV resistance & color stability

Sikagard® 670W acrylic protective coating spray applied. Excellent option to increase light reflectivity and brightness

SIKA FULL RANGE SOLUTIONS FOR CONSTRUCTION:

WATERPROOFING

CONCRETE

REFURBISHMENT

SEALING AND BONDING

FLOORING

ROOFING

FOR MORE INFORMATION:

All sales of Sika products are subject to Sika's current Terms and Conditions of Sale available at www.usa.sika.com or by calling 201-933-8800. Prior to each use of any Sika product, the user must always read and follow the warnings and instructions on the product's most current Product Data Sheet, product label and Safety Data Sheet, which are available at www.usa.sika.com or by calling Technical Services at 1-800-933-7452. Nothing contained in any Sika materials relieves the user of the obligation to read and follow the warnings and instructions for each Sika product as set forth in the current Product Data Sheet, product label and Safety Data Sheet prior to product use.
The sale of all Sika products are subject to the following Limited Warranty:

LIMITED MATERIAL WARRANTY

SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor.

NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.

Our most current General Sales Conditions shall apply. Please consult the Product Data Sheets prior to any use and processing.

RESPONSIBLE CARE
OUR COMMITMENT TO SUSTAINABILITY

U.S. GREEN BUILDING COUNCIL MEMBER

BSI
ISO 9001
RC 14001

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