



# SIKA AT WORK

## SAAS-FEE CAR PARK, SWITZERLAND

CONCRETE STRUCTURAL HEALTH CORROSION MONITORING: DuraMon®

STRUCTURAL STRENGTHENING: Sika CarboDur®, Sikadur®

CONCRETE REPAIR: Sika MonoTop®

CONCRETE PROTECTION: Sikagard®

FLOORING: Sikafloor®, SikaScreed

JOINT SEALING: Sikadur Combiflex® SG



BUILDING TRUST



# COMPREHENSIVE EXPERTISE

Repair and Protection solutions for aged parking garages P3 and P5



Renovated parking garage P3

## PROJECT DESCRIPTION

Saas-Fee is car-free and has created various parking options at the village entrance. The Saas-Fee Car Park is composed of several parking garages.

Parking garage P3 (9-story) and P5 (11-story) were built in 1980s. Both of them recently showed serious age-related damages due to chloride induced corrosion and freeze and thaw cycles. In order to guarantee the safe use of the

structures, Sika supplied and applied the refurbishment systems to both parking garages. The renovation of P3 was completed in 2022, while the work on P5 was started in 2023 and will last until 2024. In 2023, Sika's partner DuraMon installed DuraMon's concrete structural health corrosion monitoring system in P5 to monitor the structure's condition over time and the time during which Sika's repair solution keeps corrosion activity below a certain level. With this, the most appropriate future repair measures can be timely applied.

## TYPICAL DAMAGES IN SAAS FEE CAR PARK BEFORE REFURBISHMENT



## PROJECT REQUIREMENTS

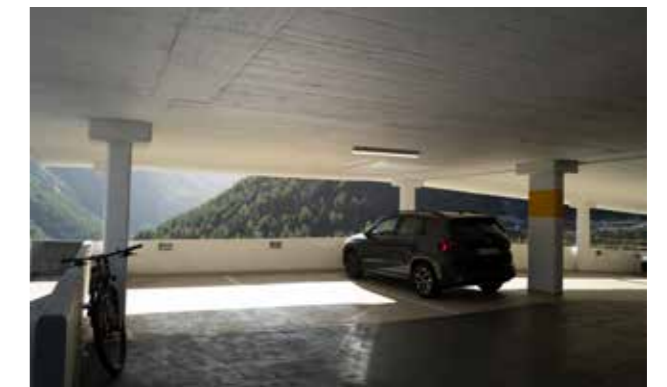
To enhance structural safety, concrete walls should be incorporated into the construction for reinforcement. Furthermore, the chloride-contaminated concrete floor layer should be removed, reprofiled, and coated with a parking deck finish. On the exposed top deck, as well as around the columns, ultra-high-performance concrete (UHPC) should be applied to the concrete floor of P3. Additionally, the ceilings and walls need

to be painted with a protective coating, and each floor should be renovated visually appealing.

The ceilings, columns, and walls needed to be cleaned and well prepared for painting. Then protective coating should be applied. Up to 50 mm of concrete floors needed to be removed, reprofiled, and coated with an epoxy resin finish.



P3 After refurbishment.



# COMPREHENSIVE EXPERTISE

Repair and Protection solutions for aged parking garages P3 and P5

## SIKA SOLUTIONS

### Substrate Preparation:

Damaged concrete floors were removed using ultra-high-pressure water. Ceilings, walls, and columns were cleaned with high-pressure water, revealing inadequately covered reinforcement.

Following the preparation, various repair and protective products were applied:

Concrete repair	
Sika MonoTop®-910 Eco	Primer for concrete with bonding slurry for subsequent mortar application on concrete.
Sika MonoTop®-412 Eco	Mortar for the reprofiling of voids, fillets, and defects in concrete.
Sika MonoTop®-452 N	Mortar for the reprofiling of irregularities in concrete surfaces.
Sika MonoTop®-422 PCC	Mortar for the reprofiling of irregularities in concrete surfaces.
Sealing	
Sikadur-Combiflex® SG System	Sealing of construction and movement joints in structural concrete.
Sikaflex®-406 Pavement	Sealing of joints in drivable surfaces.
Sikadur® Injection-52	Injection of cracks in concrete structures.
Structural strengthening	
Sika® CarboDur® S	Structural reinforcement of a concrete ceiling with CFRP (Carbon Fiber Reinforced Polymer) laminates.
Sikadur®-30	Epoxy resin-based adhesive system for CFRP laminates.
Concrete protection	
Sikagard®-675 W ElastoColor	Coating of concrete ceilings and walls.
Flooring	
Sikafloor® EpoCem Modul	Primer for subsequent self-leveling flooring.
Sikafloor®-81 EpoCem	Self-leveling flooring for leveling the unevenness in the parking decks.
Sikafloor®-161	Epoxy resin-based primer for subsequent synthetic resin floor coverings.
Sikafloor®-390 N	Coating of the parking deck floors.
Concrete Floor Repair	
SikaScreed®-30 CBB	Primer for the subsequent hard concrete topping on the top (uncovered) parking deck.
Hard concrete surface	UHPC (Ultra High-Performance Concrete) for ramps and parking decks.



# DURAMON'S STRUCTURAL HEALTH CORROSION MONITORING SYSTEM AT P5



The P5 car park in Saas Fee is an eleven-story structure. During an inspection in 2022, extremely high chloride contents were discovered in many areas, exceeding the limit of 0.4% by mass based on cement as specified in SIA standard 269/2.

Despite the elevated chloride content, corrosion had not yet initiated or had not reached a critical level. This could be attributed to the relatively dry conditions of the concrete, which inhibited corrosion propagation. However, the presence of such high chloride levels poses a significant risk of corrosion, which could potentially jeopardize structural safety if moisture enters the concrete.

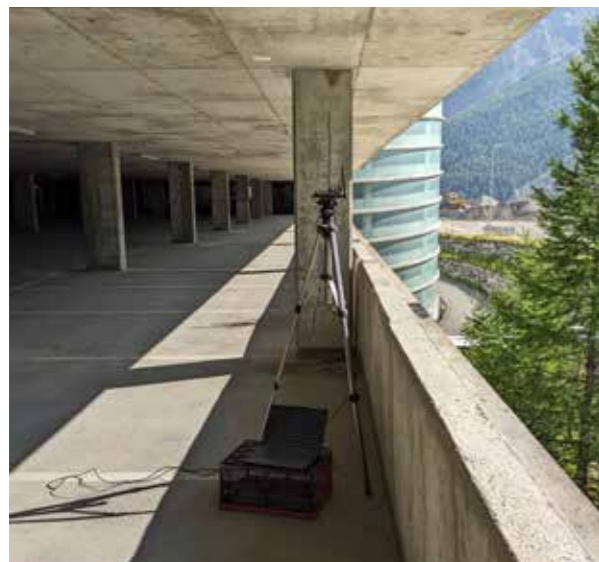
To ensure the structural safety of the parking garage, Sika provided and applied refurbishment systems to the concrete structure. Subsequently, DuraMon installed a structural health corrosion monitoring system to track the performance of Sika's protective measures over time.

The traditional method of concrete repair, involving the removal of contaminated concrete and subsequent application of new concrete, is highly time-consuming, costly, and severely disrupts the use of the structure due to closures, noise, dust, and other inconveniences, resulting in substantial revenue losses and disrupting the productivity and leisure time of the users. Instead of this, Sika's protective system (Sikagard® and Sikafloor®) and DuraMon's structural health corrosion monitoring were implemented as an alternative corrosion protection measure.

Sika's protective systems (Sikagard® and Sikafloor®) were locally applied in selected areas (September 2023). Sikagard® aims at preventing the penetration of additional chlorides and moisture into the structural concrete, while also allowing the concrete to dry out so corrosion activity can be kept below an acceptable limit.

DuraMon's structural health corrosion monitoring system was installed between September and October 2023. This system monitors the condition of the structure over time, both in areas with Sika's protective system (Sikagard® and Sikafloor®) and in areas without any protective system (reference areas).

DuraMon's structural health corrosion monitoring system offers a unique opportunity for long-term monitoring of all relevant parameters associated with corrosion in concrete. This significantly enhances the value provided to the customer by allowing verification of whether corrosion remains below an acceptable level and assessing the duration of prevention against aggressive agents' ingress. Furthermore, the collected data can be utilized to gain a better understanding of the underlying corrosion development in different locations within the structure. With these results, lessons can be quickly learned, facilitating the accurate selection of the type and timing of the next repair over a broader area in the parking garage.



DuraMon multisensory were installed in well defined locations in the existing concrete structures. Some of these locations were protected with Sikagard® or Sikafloor® coatings, while the rest remain untreated (reference areas). The following photos show the installation on the construction site.



Typically, Sikafloor® system does not allow vapour diffusion, so the concrete CAN NOT dry out.



# SAAS-FEE CAR PARK, SWITZERLAND



## PROJECT PARTICIPANTS

**Project owner:** Municipal Community Saas-Fee

**Engineer:** Truffer Engineering Consultancy AG, 3901 Lalden

**Contractor:** SikaBau AG, Branch Steg; DuraMon AG

**Corrosion monitoring system applicator:** DuraMon AG

**Sika organization:** Sika Switzerland



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