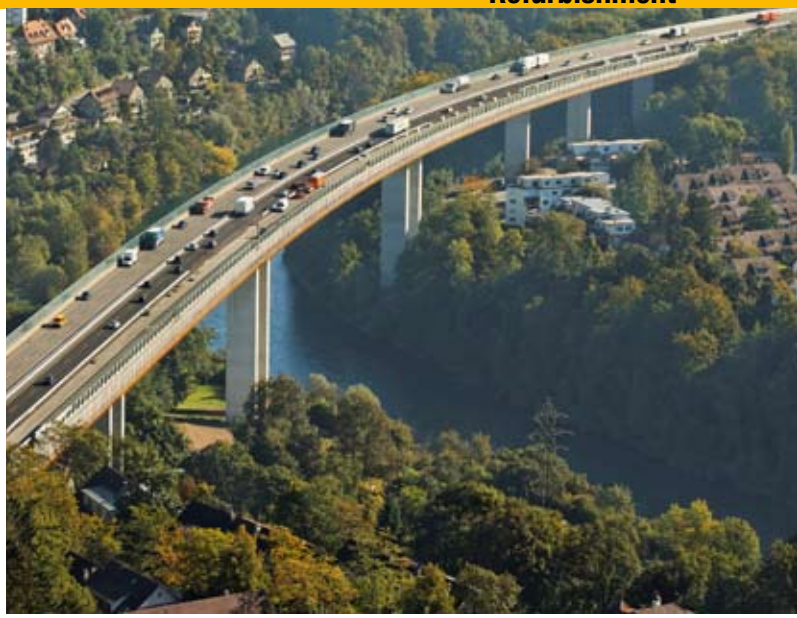
Sika at Work



Repair and Protection for Concrete and Steel Bridge Structures

– Sika Expertise is All Around the World

Refurbishment:

SikaTop®, Sika® MonoTop®, SikaGrout®, Sikadur®, Sika® FerroGard®, Sikagard®, Sika® Carbodur®, SikaCor®, Sika® Ergodur®

Sika®

Innovation & Consistency | since 1910

The Ernest Oppenheimer Bridge over the Orange River, South Africa

Project Description

The Ernest Oppenheimer Bridge is located on the Namibian West Coast of Southern Africa and was originally built in 1965. The bridge is made of reinforced concrete and its length is 940 m, with 24 spans of around 38 m long each.

In December 1995, a thorough Condition Survey revealed numerous areas in an advanced stage of deterioration due to reinforcement corrosion, following progressive natural carbonation, plus moderate levels of marine chloride attack.

Project Requirements

A complete concrete repair programme was required, including future protection of the concrete and its reinforcing steel against the aggressive exposure conditions in this part of the world.

Sika Solutions

The complete Sika concrete repair and protection system selected was applied following removal of the damaged concrete and mechanical preparation of the concrete and exposed steel surfaces.

Corrosion protection of the exposed steel with slurry applied **SikaTop®-100 Armatec® EpoCem®**, followed by hand placed patch repairs with **Sika® MonoTop®-612**, or poured repairs using **SikaGrout®-212**.

Elements with structural cracks were restored to their originally designed load bearing capacity, by the injection of **Sikadur®-52**, low viscosity epoxy resin

The embedded steel reinforcement was protected against latent corrosion development in future, by application of **Sika® FerroGard®-903** migrating, surface applied corrosion inhibitor.

Finally to prevent further progression of the carbonation front and future chloride ingress **Sikagard®-550 W** Elastic, elastic, crack bridging protective coating was applied to the beam surfaces.

Some of the bridges bearing pads were also in need of replacement and so this was carried out using high strength **Sikadur®-42**, structural epoxy resin based grout.

Project Participants

Owner: Namibian Diamond Corporation (Namdeb)
Consultant: Ninham Shand Consulting Services
Contractor: Civil and Coastal Construction (Pty) Ltd

The Pfeddersheim Viaduct near Worms on the A61 Motorway, Germany

Project Description

The Pfeddersheim viaduct near Worms on the A61 motorway in Germany crosses the River Rhine valley for a length of 1.5 km. The reinforced concrete bridge deck structure was deteriorating and showed signs of serious chloride related damage, due to the frequent use of de-icing salts in winter for an ever-increasing traffic load.

Project Requirements

A detailed Condition Survey revealed that not only was the waterproofing layer on the concrete carriageways in need of complete replacement, but over 40,000 m² of the top layer of the structural concrete deck was also in urgent need of repair to prevent more serious structural damage.

Sika Solutions

A complete concrete repair system was selected according to German Standards ZTV-ING, using **Sika® MonoTop®-602** cementitious bonding slurry, followed by **Sika® BL-04** and **Sika® BE-08**, horizontally flow applied, polymer modified, cement based repair mortars. Curing of these freshly applied mortars was reliably achieved by completely covering them with plastic sheeting for a period of 7 days.
For the deck waterproofing, a Sika system complying with ZTV-ING part 7, Section 1 was applied. This was **Sika® Ergodur®-500**, an epoxy resin priming coat, followed by torched on polymer modified, reinforced bitumen sheeting. Finally a wearing course of mastic asphalt (7 cm thick) was laid.

It took only 5 months to complete the whole of the deck refurbishment and waterproofing programme, through the use of a complete, integrated and fully compatible Sika system.

Project Participants

Owner: Highways Authority, Federal Republic of Germany
Consultant: Max Bögl Bauunternehmung GmbH & Co
Contractor: Max Bögl Bauunternehmung GmbH & Co

Toutry Viaduct Carrying the A6 Motorway, France

Project Description

The Toutry Viaduct (21) carrying the A6 motorway in Eastern France, was built in the late 1960's. The 227 m long structure consists of 7 separate spans of 32 m long, prestressed, reinforced concrete beams, these then carry the 2 parallel decks, which are each supported by 4 of the beams.

Project Requirements

Increased traffic forecasts for the motorway demanded that some of the sections needed to be expanded and upgraded from their current 'two by two' lane carriageways, to new 'two by three' lane carriageways.

To accommodate this increase, structural strengthening works to the beams supporting the motorway were an important requirement and priority for the owners, as was maintaining access with continuous traffic over the bridge during the works. The structural engineers' analyses had indicated that the primary need was for longitudinal flexural strengthening of the beams

Sika Solutions

Whilst normal traffic flows on the viaduct were maintained across the viaduct, the inner and outer supporting beams below each deck were strengthened with the surface bonded **Sika® Carbodur® CFRP** plate system.

This carbon fibre reinforced strengthening system was selected because of the ease and speed of its installation.

Additional protection against carbonation and freeze-thaw reaction was given to the concrete surfaces using **Sikagard®-680 S**, an acrylic resin based high performance coating.

Project Participants

Client: APRR (Autoroutes Paris Rhin Rhône), Regional Directorate of Bourgogne

Project Manager: APRR, Bourgogne Regional Directorate, Infrastructure and Environment.

Consulting Engineers: BE Clément

Contractor: Sorreba Bourgogne (21)

Quality Control: CETE Lyon and LRPC Autun, OAIP Department




Dolny Kubin Bridge over the River Orava, Slovakia

Project Description

This bridge crossing the River Orava in Dolný Kubín was originally built in 1949 and was constructed from two spans with continuous reinforced concrete beams of variable thickness to suit the design load capacity.

Project Requirements

The bridge was showing visible signs of concrete damage and structural deterioration, with localised reductions in flexural strength and also some loss of rigidity.
Therefore concrete repair and structural strengthening was necessary to refurbish the bridge. Additionally the owner wanted to increase its structural load carrying capacity and protect the structure against future damage and deterioration.

Sika Solutions

The repair of the concrete surface was undertaken first, using **Sika® MonoTop®-615** hand placed repair mortar and **Sikagrout® -212** as a flow applied repair mortar where suitable.
The migrating corrosion inhibitors **Sika® FerroGard®-903** and **901**, surface applied or mixed with the flow applied repair mortars respectively, were used to extend the life and reduce the rate of any future steel corrosion activity.

The restoration of flexural strength and rigidity, plus the increased load bearing capacity was achieved using surface bonded **Sika® Carbodur® CFRP** plates over a total length of 45 metres on the beams.
Finally, the whole concrete surface was protected from future carbonation and freeze thaw attack by the high performance protective coating **Sikagard® -680 S**. This was also used on any exposed **CFRP** plates as protection against UV light radiation

Project Participants

Client: Slovak Road Administration IVCS Žilina)
Designer: Geoconsult s.r.o. Bratislava,
Contractors: Doprastav a.s. Bratislava, OZ Žilina
Sub-contractor: Hastra s.r.o., Žilina
Quality Control: Slovak Technical University, Žilina

Steel Bridge over the “White-Körös” River in Gyula, Hungary

Project Description

This truss girder bridge was originally built in 1914 and since then no major refurbishment or repairs had been done. The bridge condition had deteriorated through normal weathering and use, plus both bridgeheads and the steel deck had been damaged during flooding a few years earlier. There were now severe restrictions in force and in 2010, total refurbishment was essential.

Following removal of the existing wearing course and steel deck, additional structural defects were found and had to be strengthened. A new orthotropic deck with new steel plates and supporting ribs was then fabricated to meet these requirements. The complete structure then had to be given long term protection against corrosion.

Project Requirements

The corrosion protection had to include solutions for protecting the newly fabricated components and also the retained elements of the exisitng structure, approximately 2500 m² in total . The systems had to be approved by the Hungarian Public Roads Department and also fulfill the requirements of ISO 12944:2008, Class C5I, with a minimum life to first maintenance for different areas of 5 or 15 years.

Sika Solutions

The SikaCor EG system was selected as it met all of these requirements and gave additional advantages in workability and the reduced number of applications required.

Two kinds of primer were used:

– For the existing surfaces – **Sika® Poxicolor Primer® HE**, which is suitable for site prepared,surfaces and conditions;

– For the works prepared new components **SikaCor Zinc R** was ideal. Then two intermediate coats at 80 µm dft each of **SikaCor® EG 1**were spray applied on site, followed by the two component polyurethane top coating **SikaCor® EG 5**, at 80 µm dft in RAL 6003 (green).

Project Participants

Owner: Békés County Directorate of Hungarian Public Roads (Magyar Közút Kht.)

Engineer: SPECIÁLTERV Építőmérnöki Kft.

Main Contractor: KÖZGÉP Építő- és Fémszerkezetgyártó Zrt.

Painting Sub-Contractor: Közgéphídkorr Kft.

Quality Control: Minden-Korr Bt.

Viaduct Bridges Carrying the A1 Highway, Bern, Switzerland

Project Description

Since March 2010, the two-year refurbishment of the tangential A1 highway North of the City of Berne has been underway. The project includes a total of 50 structures and one major element is the refurbishment of the Felsenau Viaduct, which is 'two by three' lanes, 1.1 km long and up to 60 m high.

The carriageways are on cantilever slabs with 26.2 m wide cross-sections, piers with cross-sections of about 7.5 m carry the slabs. The span length between piers is up to 156 m for the large middle sections. It was originally built in 1975 and now had to be refurbished under continuous traffic load.

Project Requirements

Refurbishment of the concrete structure, including the horizontal decks and replacement of the bridge deck waterproofing system, plus protection of the exposed concrete surfaces against carbonation and freeze-thaw attack accelerated by the use of de-icing salts. This work is designed to maintain the serviceability of the structure for the next 30 years and to improve the structure and user safety according to the latest Standards.

Sika Solutions

The horizontal concrete deck refurbishment was done using **SikaTop®-122 SP** (800 t), then **Sikadur®-186** (68 t) was used for the deck waterproofing.

The reinforced concrete parapet walls and other surfaces were given long term protection with **Sikagard®-706 Thixo** (0.6 t), **Sikagard®-551 S Primer**, **Sikagard®-545 W Elastic** and **Sikagard®-550 W** (2.6 t).

Project Participants

Client: Federal Roads Office FEDRO (ASTRA)
Project Manager: Federal Roads Office FEDRO (ASTRA)
Consulting Engineers: IUB, Bern, Emch+Berger, Bern
Contractor: ARGE Felsenau: Marti AG; Bern; Frutiger AG, Thun; Implenia Bau AG, Bern
Quality Control: Federal Roads Office FEDRO (ASTRA)

The Galicyjska Flyover in Krakow, Poland

Project Description

This reinforced concrete bridge was completed in 2004 and is an important infrastructure connection for the area around Krakow's Main Railway Station. It has an overall length of 1,100m with a 600 m long central flyover section.

Project Requirements

As it is located in the heart of the city, the new concrete structure would be subject to continuous urban traffic pollution, together with high freeze-thaw stresses accelerated by heavy de-icing salt use, due to the harsh winter weather conditions in this region of Poland.
Additionally, due to its prominence and proximity to the City Centre and the Main Railway Station, the bridge also needed to have and to maintain a good visual appearance for the City Authorities.

Sika Solutions

After preparing and filling any concrete surface defects and blow holes with **Sika® MonoTop®** mortars, the high performance, elastic, crack-bridging coating **Sikagard®-550 W Elastic**, was used to enhance the appearance and protect the supporting columns against the future ingress of aggressive pollutants and de-icing salts, to prevent future damage due to freeze-thaw action.
The main beams were produced using pre-stressed, precast concrete segments that were also visually enhanced and protected against carbonation and other pollutant ingress by the application of **Sikagard®-680 S**, a high performance, rigid protective coating.

Project Participants

Owner: City of Krakow
Consultant: Budostat 5
Contractor: Gran

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