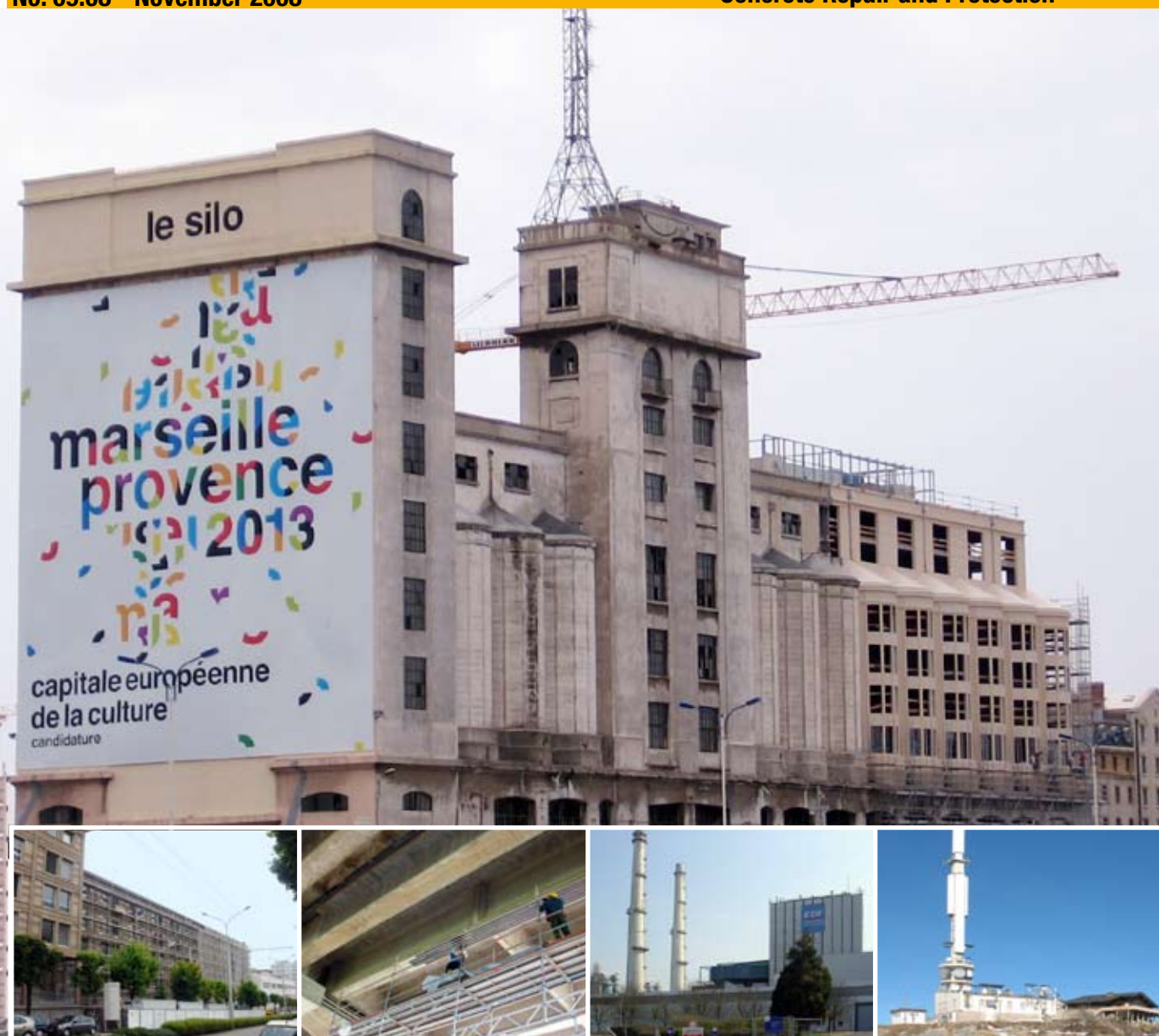


Sika at Work



## Refurbishment Projects in France

### Case Studies: Viaduct, Silos, Power Station and Television Tower

Ready to Use Mortars: **Sika® MonoTop®, SikaTop®**

Concrete Protection: **Sikagard®, Sika® FerroGard®**

Structural Strengthening: **Sika® CarboDur®, SikaWrap®**







## CPAM Limoges Headquarters Building

### Project Description

The Health Insurance Fund (CPAM) building at Limoges (87) dating from 1953 was originally designed by a disciple of the famous architect Auguste Perret. However, now its exposed aggregate concrete facade was now suffering from spalling concrete over corroding steel reinforcement, caused by carbonation of the concrete.

### Requirements

Earlier in 1998, some initial patch repairs had been made with synthetic resin mortars, but these had proved unsatisfactory in terms of both their aesthetics and performance. The refurbishment works now had to be carried out whilst the building was fully occupied, be designed to be durable long term and also to restore and not reduce the original attractive appearance of the structure.

### Sika Solutions

A Sika repair proposal was selected, which enabled the 4,500 m<sup>2</sup> concrete surfaces of the facade to be fully restored and protected for the future, whilst retaining its original appearance. The local repairs were carried out using **SikaTop®-122 F**, followed by site prepared finishing mortar adjusted to be identical to the original surface, and then the long term durability was assured by applying **Sika® FerroGard®-903** corrosion inhibitor followed by a colourless protective top coating of **Sikagard®-681 Protection**.

### Project Participants

**Client:** CPAM Limoges

**Project Manager:** Saunier & Partners

**Quality Control Office:** APAVE

**Contractor:** Spie Batignolles Technologies



## Toutry Viaduct – A6 Motorway

### Project Description

The Toutry Viaduct (21) on the A6 motorway was built in the late 1960's. The 227 m long structure consists of 7 separate spans of 32 m long prestressed RC beams, these carry the 2 parallel decks, each supported by 4 of the beams.

### Requirements

Increased traffic forecasts for the motorway demanded that some of the sections needed to be upgraded from their current two by two lane carriageways, to two by three lane carriageways. To accommodate this increase structural strengthening works to the beams supporting the motorway were a priority. The engineers' analyses had indicated the need for longitudinal flexural strengthening of the beams.

### Sika Solutions

Whilst normal traffic flows on the viaduct were maintained, the inner and outer support beams of each deck were strengthened with surface bonded **Sika® CarboDur®** plates. This carbon fibre and epoxy resin adhesive based system was selected because of the ease and speed of its installation, in contrast to traditional strengthening techniques. Additional UV protection was applied to the concrete surfaces with a coating of **Sikagard®-680 S**. The LRPC Autun Laboratory was responsible for QA/QC of the works and also appointed to carry out future monitoring of the strengthened structures.

### 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



## EDF Power Station Chimneys, Champagne-sur-Oise

### Project Description

The EDF power station at Champagne-sur-Oise (95) was originally constructed during the 1960's and it includes two 110 m tall reinforced concrete chimneys. The chimneys were decommissioned, but as they contained asbestos this had to be removed and the structures cleaned, in order to be able to eventually demolish and remove them safely. The equipment to do this had to be attached to the top of the chimneys and therefore they first had to be strengthened, so that this could be erected and carry out the decontamination.

### Requirements

The detailed inspection and analysis of the chimneys' condition resulted in a recommendation for them to be structurally strengthened, particularly at the tops, to enable the necessary equipment to be safely and securely installed, despite the cracked condition of the concrete structures.

### Sika Solutions

Using a fixed platform and working from the top, the first chimney was strengthened where necessary by stitching across the structural cracks, using bonded carbon fibre plates **Sika® CarboDur® S 1512** and **S 1012**.

The second chimney was then vertically strengthened and the **Sika® CarboDur®** plates were installed moving upwards from a scissor-lift through the cracked areas.

### Project Participants

**Client:** EDF – Post-Operations Centre

**Assistant Project Manager:** EDF – Thermal Engineering Centre

**Project Manager:** Arnaud Demolition

**Quality Control Office:** Socotec – Central Operations Directorate

**Consulting Engineer:** Eiffage TP

**Design Office:** Eiffage TP – Civil Engineering Technical Service

**Contractor:** Eiffage TP – Nuclear Engineering Department



## TDF Television Tower, Mont Gex

### Project Description

The Mont Gex TDF Television Tower in Ain (01) is a relay transmitter for all types of telecommunications (television, radio, telephone etc). The structure is 88 m tall and consists of a square reinforced concrete base and lower section that was constructed in the 1960's, surmounted by a metal pylon.

### Requirements

A condition survey of the structure carried out by the CEBTP, supplemented by structural analyses from their Consulting Engineers, revealed the need to upgrade the structure. This was in order to comply with changes in the latest design and operating regulations, as well as an increase in the wind resistance (additional equipments and large telecommunications' antennas).

### Sika Solutions

In view of the number of sections requiring strengthening and the limited area available to take the vertical strengtheners, an innovative solution using carbon fibre plates **Sika® CarboDur®**, bonded to the concrete substrate was selected.

### Project Participants

**Client:** TDF

**Project Manager:** TDF – Engineering and Infrastructure Directorate

**Quality Control Office:** Socotec – Central Operations Directorate

**Design Office:** Eiffage TP – Civil Engineering Technical Service

**Contractor:** Résirep (Eiffage Group)





## Arenc Silos, Marseille

### Project Description

The Arenc Silos were originally erected in the late 1920's and they have become a well-known landmark for the people of Marseille and the many users of the "Autoroute du Soleil" highway. However the grain silos have now been out of use for many years.

### Requirements

A complete redevelopment of the whole port and docks area is currently being undertaken by the City of Marseille, under the name of the "Euroméditerranée" project. As part of this project, it is planned to convert these former industrial silos into a cultural complex and this reinforced concrete Marseille landmark – is set to become a Unesco World Heritage site.

### Condition Survey

Due to their lengthy period of closure and the proposed change of use, plus the proximity to the marine environment of the port, a Condition Survey with an in-depth analysis was carried out by the LERM (Laboratory specialised in concrete). This included detailing of the visible damage such as concrete spalling and steel corrosion, plus measuring the depth of embedded reinforcement, levels of chlorides, carbonation etc.

The results showed that the structure was suffering from typical defects associated with aggressive industrial environments and the age of the concrete (carbonation and corrosion of steel near the surface).

However, despite the proximity of the sea, the levels of chloride contamination were relatively low.

Structural strengthening was also deemed necessary because of the new window openings that are being made in the silo walls during their conversion.

### Sika Solutions

Protection of the steel reinforcement with **Sika® MonoTop®-610 AC** & localised patch repairs with **Sika® MonoTop®-612 F**.

Future corrosion prevention by application of the corrosion inhibitor **Sika® FerroGard®-903**.

Strengthening by installation of **SikaWrap®** carbon fibre fabrics where required.

Protection and aesthetic improvement by application of **SikaTop® -107**, a coloured, polymer modified, cement based slurry coating, as anti-carbonation protection, and to restore and maintain the original mineral appearance of the structure.

### Project Participants

**Client:** City of Marseille

**Project Manager:** Éric CASTALDI (Architect)

**QA / QC Laboratory:** LERM

**Contractor:** MIDI FACADES

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**Sika Services AG**  
Corporate Business Unit Contractors  
Speckstrasse 22  
CH-8330 Pfäffikon  
Switzerland  
Phone +41 58 436 23 64  
Fax +41 58 436 23 77  
www.sika.com

