The major project

COATZACOALCOS BRIDGE

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Freyssinet continues its renovation work on the Hammersmith Flyover: this new phase follows an initial phase of works completed in 2012. Work to strengthen the structure commenced in January 2014 and includes replacing the existing prestressing system, in partnership with the main contractor. Completion is scheduled for 2015.
A word from the editor

Structural repair, a vital necessity

According to a study published by the American Road and Transportation Builders Association, one in ten (over 63,000) bridges in the United States is in urgent need of repair. These structures, which are «used more than 250 million times a day» no longer meet the required safety conditions.

A structure lives, ages and undergoes changes over time. Repairs are always a complex operation requiring meticulous attention to detail, just like a new build. Now more than ever, Freyssinet’s expertise is being called upon for a growing number of repair projects. Our specialist teams can support our customers during diagnosis of their structure in order to identify the right technical solution, whether it be concrete repair, protection of the concrete reinforcement, structural reinforcement or protective coating. These techniques are covered by a family of solutions grouped together under the FOREVA® brand.

We select or devise innovative methods for repair work in order to limit the impact of the works on users and local residents. For example, the employees at the MLC Centre in Sydney (Australia) can carry on working without any noise pollution, the Puymorens Tunnel (France) is open to traffic again during the winter months, and the Agigea Bridge (Romania) is being repaired with no major interruption to traffic.

We are also giving a new lease of life to the Hammersmith Flyover in London (United Kingdom), not to mention numerous historical monuments such as the Grand Commun in Versailles (France), and industrial installations like the coal terminals at the port of Newcastle (Australia).

Every day, our teams are working to successfully complete our projects and provide customer satisfaction, pooling our efforts to extend the service life of these structures and the safety of their users.
The height, in metres, of the precast prestressed concrete towers designed and built by Freyssinet that will be used for wind turbines as part of a partnership with Alstom in Trairi, Brazil. The new farm of 36 wind turbines will be built using an innovative construction method centred around a lifting tool known as Eolift. Very tall towers can significantly increase the energy produced by wind turbines by capturing wind higher up, where it is stronger and steadier.

Bangkok is extending its public transportation network. Freyssinet is carrying out post-tensioning work of precast segmental viaduct Mass Transit Red Line project. The structure consists of a 19.2 kilometre elevated viaduct above the city’s streets and buildings. Freyssinet is also involved in the post-tensioning of precast segmental viaduct Blue Line project which comprises of 4054 segments and about 3250 ton of prestressing.

Freyssinet has recently signed two major construction contracts in Hong Kong: the Liantang 3 (LT3) bridge, near the Chinese border, and the viaduct section of the Tuen Mun–Chek Lap Kok Link (TMCLK). Both are balanced cantilever precast segmental bridges. The two structures will be completed by the end of 2017.
Freyssinet will be attending the 26th World Gas Conference, which is to be held in Paris from 1 to 15 June. Find us on stand K36 in Hall 1 at the Parc des expositions at Porte de Versailles. For more information, visit the conference website: www.wgc2015.org

“Safety needs team commitment.”

Just as a chain is only as strong as its weakest link, we must ensure none fails. We do this by looking out for one another, reminding all workmates of the need for safe work practices. Safety Week reminded us that any event can have far reaching consequences along the chain and to reflect on how the team measures up.

The next big thing

Turnkey footbridges

Freyssinet is offering the construction of made-to-measure, turnkey footbridges. A new 12-page brochure shows numerous examples of Freyssinet projects all over the world, involving UHPFC (Ultra High Performance Fibre Concrete), reinforced concrete, metal and timber, suspended and non-suspended footbridges. The brochure can be ordered directly on the Freyssinet website (www.freyssinet.com) or from one of our offices around the world.
The encounter

OLIVIER FORGET, DIRECTOR OF FREYSSINET PRODUCTS COMPANY

ISOSISM®, a range of products dedicated to the dynamic protection of structures

Can you give us an introduction to ISOSISM®?
The expertise that Freyssinet has developed in the field of construction and structural accessories means that we are now in a position to offer a comprehensive range of products dedicated to the dynamic protection of structures in the event of an earthquake, known as ISOSISM®. These products, used individually or in conjunction with other products in the range, give our customers effective, tailored protection for all types of structure.

What does the ISOSISM® range consist of?
Our offering is based on the four fundamental operational modes of protection, namely isolation, connection, dissipation and joints. Freyssinet provides specific products for each mode, such as isolators or pendulum bearings, for example. We have complete control over the products, from the design stage with our Technical Department, through manufacturing at our dedicated plants, to installation.

That’s why we are able to offer solutions that are completely tailored and optimised for each project. This unique integrated expertise guarantees the quality and satisfactory operation of ISOSISM® structural accessories.

Can you give us some examples of applications?
In terms of the seismic isolation of existing buildings, Freyssinet teams are currently installing isolators and dampers at Bucharest City Hall in Romania. We will be starting work soon at Marmara Hospital in Turkey. With regard to new structures, we are supplying all of the hydraulic dampers and connectors for the Struma Bridge in Bulgaria. We have also isolated LNG tanks in Taishan, China.

In practical terms, if I want to use products from the ISOSISM® range, who should I contact?
Freyssinet operates in over 70 countries worldwide. The Locations page on our web site contains the contact details of your nearest office. You can also request information using the Contact form on the web site.

Want to find out more?
Order the dedicated brochure on our web site.
In Cadiz, southern Spain, Freyssinet Spain has been working for eighteen months to install the stay cables on the La Pepa Bridge. The structure, a cable-stayed bridge with a 540 m span and 60 m of vertical clearance, will be the second crossing over the Bay of Cadiz. Freyssinet is also involved in post-tensioning the piers and is supplying the elastomeric bearings. The end of Freyssinet’s work is scheduled for February 2015.
United States

WILLAMETTE RIVER TRANSIT BRIDGE
A GREAT SUCCESS FOR FREYSSINET STAY CABLES IN THE UNITED STATES

In Portland, Oregon, Freyssinet has recently completed work on the Willamette River Transit Bridge (WRTB), a cable-stayed bridge with multtube saddles located at the heart of the city and designed to accommodate pedestrian, cyclist, bus and tramway traffic. Freyssinet supplied the materials and equipment for installing the stay cables, and provided technical assistance. Crews were at the site from March 2013 to July 2014.
Freyssinet plays an important role in skyscraper construction in Dubai, and the wider United Arab Emirates. The company’s prestressed flooring expertise makes it the partner of choice for architects. A special brochure about prestressed slabs is available on the web site at www.freyssinet.com.
The major project

COATZACOALCOS BRIDGE

The Coatzacoalcos I Bridge lies south-east of the city of Coatzacoalcos in the State of Veracruz, Mexico, on a strategic traffic route for the country. Opened in 1962, this road and railway lift bridge required considerable repair and reinforcement work. Freyssinet took charge of this major project, which was completed in several stages between October 2011 and October 2014.

The city of Coatzacoalcos is home to what is considered to be the third most important commercial and industrial port in the Gulf of Mexico; the port is connected to strategic routes by the Coatzacoalcos river estuary. The bridge is a total of 966 metres long, with isostatic spans made up of prefabricated post-tensioned concrete beams and a cover slab, and carries high levels of mixed road and railway traffic. The significant humidity and salinity and very high pollution levels in the region were threatening the steel reinforcements used in the structure, putting them at risk of spalling, corrosion and cracking. Major works were necessary to strengthen and protect the bridge.

Several phases of works

The first step involved reinforcing the central piers, compensating for the slope and transferring the load. The neoprene bearings and expansion joints were replaced, the structure was waterproofed and the most damaged areas were repaired with carbon fibre fabric (TFC). A few months later, it was the turn of the steel spans. The columns were given a protective coating, shear strength on the railway superstructure was increased using carbon fibre, external prestressing was installed on every concrete section and a corrosion inhibitor was applied. Next, the lift span was given a make-over, including a complete structural overhaul and rehabilitation of the lift system.

A brand new lift span

The lift towers were reinforced and the existing frame of the lift span was dismantled. The new lift frame installation operations started at the end of August 2014 and the bridge was reopened to traffic a few days later.

The essentials

— The project: Repairing and reinforcing a strategic traffic link in Coatzacoalcos, south-east Mexico.
— The structure: A road and railway lift bridge with corrosion-damaged steels and concretes.
— Duration: The work was carried out in four phases between October 2011 and October 2014.

A real rejuvenation for this key infrastructure in the State of Veracruz.

The partners

— Client: Centro SCT Veracruz
— Owner: Mexican Ministry for Communication and Transport
— Engineering: Euro Estudios S.A de CV

1 210 tonnes of steel

Concrete for the piers: 5,745 m³
Steel reinforcements: 540 tonnes
Prestressing steel: 57 tonnes
Structural steel for reinforcing the lift towers and the new lift frame: 610 tonnes
Carbon Fibre Fabric: 7,135 m²
“On this structure used by 20,000 vehicles a day, we made our best to minimize the impact on the traffic. The replacement of the lift span was carried out in only 4 days! A real technical prowess completing all the reinforcement operations achieved on the bridge.”

MARTÍN, FREYSSINET MÉXICO REGIÓN SURESTE DIRECTOR
The essentials

CONSTANTINE BRIDGE

—the project:
The Constantine Bridge is the second cable-stayed bridge in Algeria, and is a key structure in easing traffic congestion in the city, which has a population of 450,000.

—the installation:
Freyssinet supplied and installed the stay cables and provided technical assistance for the installation of the longitudinal and transverse prestressing and the Freyssibars to reinforce the slender 130 m tall towers.

—the duration:
The work started in early 2013 and the bridge was opened on 26 July 2014.

Constantine, nicknamed the «City of Bridges», welcomes its first cable-stayed bridge. This 1,150 m long structure crosses the Rhumel and is supported by a single central plane of 56 H2000 stay cables supplied by Freyssinet. The longest stay cables (146 metres) are fitted with IRD dampers and the shortest with IHD dampers. Freyssinet also supplied and provided technical assistance for the installation of the 400 tonnes of longitudinal and transverse prestressing, as well as approximately 19 tonnes of Freyssibars to reinforce the slender 130 m tall towers. Located in an earthquake risk zone, the bridge is fitted with 56 pot bearings and 12 banded elastomeric bearings, designed and produced to withstand major earthquakes and adapt to large variations in temperature (approximately 60°C).
Freyssinet has been working on the site of the new theatre and clinical support block at Pierre Zobda-Quitman hospital in Fort-de-France, Martinique. Located in a high risk earthquake area, the new building had to meet stringent earthquake protection standards to ensure continuity of medical activities in the event of an earthquake or cyclone. Another specific feature lies in the building being designed as a single block, without any expansion joints, as these are a known source of transmission of hospital-acquired infections. To meet the challenge presented by this unconventional structure, Freyssinet designed and supplied an earthquake protection device made up of a layer of isolators coupled with dampers.

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**The essentials**

**FORT-DE-FRANCE UNIVERSITY HOSPITAL**

— **The project:** Supplying an earthquake protection device for the new theatre and clinical support block at Pierre Zobda-Quitman Hospital in Fort-de-France, without expansion joints, in a very high earthquake risk area.

— **Installation:** Freyssinet designed and supplied 288 Isosism HRDB elastomeric isolators and 36 FVD dampers.
The Achievements

Korea

JUKSEONG JEONGOK, A NEW FREYSSINET PROJECT IN KOREA

Jukseong Jeongok is a cable-stayed bridge located in South Korea, near the North Korean border. The structure is made up of a mixed main span (steel girder segments and prestressed slab elements), two A-shaped towers and H2000 stay cables. For this project, the Freyssinet teams produced and installed the prestressing for the main span and supplied and installed the H2000 stay cable system.

The essentials

JUKSEONG JEONGOK

- **The project:** Length of main span: 400 metres – H2000 stay cable system: Freyssinet strands, Freyssinet H2000 anchors, IHD and IRD dampers.
- **Duration:** Work started in March 2012 and was completed at the end of December 2013. Since then, new projects have been launched in Korea, including in particular two structures under construction, the Chilsan bridge and the second Taein bridge.
France

CHAUVE T CAVE, PONT-D’ARC

In the Ardèche region of southern France, Freyssinet has been actively involved in the construction of the Caverne du Pont-d’Arc, a cultural project the aim of which includes making exact reproductions of the Chauvet cave wall paintings discovered in 1994. The project consists of reproducing a 3D model of the cave onto which landscaping mortar has been sprayed and then sculpted.

The work carried out includes:
- Structural design,
- Building the metal structure to recreate the space inside the Chauvet cave,
- Creating profiles fixed to the structure,
- Spraying landscaping mortar onto the structure,
- Sculpting and glazing the mortar so that the initial drawings can be reproduced,
- Constructing the technical walkway,
- Constructing the visitor walkway.

See also the video on our YouTube channel.
The essentials

AGIGEA BRIDGE

Freyssinet is replacing the stay cables on the Agigea Bridge in Constanta, eastern Romania. The structure, a four-lane road bridge with a 200-metre main span, crosses the Danube-Black Sea Canal. It is currently suffering from significant structural damage. The technologies available when it was built in 1983 (parallel wires, steel outer sheaths, prestressed anchors, etc.) have moved on considerably; Freyssinet is now installing high-tech stay cables that will prevent premature deterioration of the structure. The Agigea Bridge is a strategic part of the country’s infrastructure, as it is the only bridge over the Canal in the area pending the completion of a new bridge currently under construction. Freyssinet is also involved in that project (stay cables, bearings, prestressing, expansion joints and earthquake protection devices).

The Achievements
Australia

KOORAGANG & CARRINGTON COAL TERMINAL WHARF

In the port of Newcastle (New South Wales, Australia), Port Waratah Coal Services Limited (PWCS), operates the world’s largest coal handling facility. PWCS operates two coal terminals, Kooragang Coal Terminal (KCT) and Carrington Coal Terminal (CCT).

The issues confronting PWCS related to deterioration of their concrete wharf structures at both sites. Freyssinet was awarded the head contract to remediate the structures. Freyssinet’s work brief for the project included remediation of 9 concrete breasting dolphins and the main wharf deck at CCT, plus 190 metres of concrete wharf structure and 5 land based strut blocks at KCT.

Freyssinet faced several challenges on the project including working over water from suspended scaffolding with full encapsulation and environmental controls. Management of these environmental controls and the work face through the daily tidal cycle was very important for productivity and QSE requirements.

In addition managing the work site operation around constant daily shipping movements at both wharves was equally important in order to avoid disruption to the PWCS business.

The essentials

KOORAGANG & CARRINGTON COAL TERMINAL WHARF

— The project: Repair works on concrete wharf structures at two coal terminal sites in the port of Newcastle, Australia.

— Implementation:
  - Hydro demolition to remove deteriorated concrete (CCT)
  - Installation of an impressed current cathodic protection system (CCT & KCT)
  - Concrete repairs & reinstatement using a combination of form & pour and hand applied techniques (CCT & KCT)
  - Application of waterproofing and decorative coating systems (CCT & KCT)
  - Epoxy crack injection (KCT)
  - Installation of flexible joints to the wharf deck (KCT)
  - Repairs to the existing wharf deck drainage system (KCT)

— Duration: Work started in September 2013, and ended in August 2014.

See also Freyssinet Australia’s website.
France

VERSAILLES GRAND COMMUN

The Grand Carré des Offices - Commun, or «Grand Commun», is a building dating from the 17th century located on the National Estate of Versailles, a stone’s throw from the Palace. Freyssinet has been involved in a huge restoration programme, commenced in 2010, to breathe new life into the façades and interiors of the historical monument. Freyssinet used its FOREVA® Wood solutions to restore the floors and timber structure of the East section of the building.

The essentials

VERSAILLES GRAND COMMUN

— The project: On the upper levels, steel floors were created to strengthen the structure of the building. The tie rods, removed to repair the floors, also had to be replaced. In addition, the least damaged wooden beams were repaired (the most damaged ones, which would have been difficult to repair, were removed).

— Duration: Work started in June 2013 and was completed in spring 2014.
The Puymorens Tunnel, near the border between France and Spain, is undergoing major work to bring it into compliance with the latest standards. A full range of fire safety features is being installed, including heat protection, shelters and an egress passage, under the supervision of Freyssinet, which is responsible for the design and implementation of the tunnel safety improvement programme.

A key element of the work is the creation of an egress passage inside the upper tube of the tunnel, which was previously occupied by the smoke extraction and ventilation ducts. This involves the construction of a shear wall over a length of 2,400 m (made up of precast concrete elements anchored in the arch) to split the existing duct in two, and the rearrangement of the ventilation system, with the installation of fans at each end of the structure, housed in completely new false tunnels.
Structure handling
Sliding: moving structures with minimal disruption to traffic

• The problem
Building or modifying structures for road and/or railway infrastructure, while reducing the impact on road and/or rail traffic.

• The solution
 Autoripage®, Autofonçage®, Air Pad Sliding: whichever method is chosen, it involves moving a new structure built near its final location. Freyssinet holds the world record for the heaviest structure moved: 21,000 tonnes.
 Autoripage®: This technique consists of completely clearing the ground and sliding the structure on bentonite grout using 1,000 t jacks. Once the sliding operation is complete, backfilling takes place in order to re-open the route to traffic.
 Autofonçage®: This technique consists of partly clearing the ground and then sliding and driving the structure forwards into the infill as the excavation work progresses, using the same equipment as for the Autoripage® technique. No backfilling is required as the volume of earth excavated is identical to the volume of the structure.
 Air Pad Sliding: This technique is identical to the Autoripage® technique, with air pad sliding bearings (APS modules) in lieu of bentonite. It consists of completely clearing the ground, installing skidways, then moving the structure on APS modules, with a friction coefficient of less than 1%. Once the sliding is complete, backfilling takes place in order to re-open the route to traffic.

• The advantages
The structure is moved over a very short period (generally two days). For work on the railway infrastructure (the most common scenario), these techniques make it possible to keep as many trains running as possible, as complete interruption to traffic is only necessary during the moving operation. In total, Freyssinet’s teams carry out around ten of these operations each year in France and elsewhere in Europe.
It was 10 years ago, in 2004, that the Charilaos Trikoupis Bridge (also known at the Rio-Antirio Bridge) in Greece was opened. At 2,883 metres long, the structure was designed to withstand earthquakes of up to 7 on the Richter scale and 250 km/h winds. The bridge is fitted with Freyssinet stay cables, renowned for their flexible installation, durability and stability in the presence of vibrations due to wind. A total of 368 stay cables was installed.*

* « Happy Birthday » in Greek

### Around the world...

**Maiden voyage for the Queen Mary II**

344 metres long and with accommodation for 3,090 passengers, the Queen Mary II was built by Chantiers Navals de l’Atlantique in Saint-Nazaire, France. The cruise liner was officially launched by Her Majesty Queen Elizabeth II and set sail on 12 January 2004 on her first crossing between her home port of Southampton and Fort Lauderdale, Florida.

**Facebook**

Facebook was founded in 2004 at Harvard University in the United States. Created by then-student Mark Zuckerberg, it was initially only accessible to those attending the prestigious establishment. The social network was opened up to the rest of the world in 2006. Facebook now has 1.32 billion active users per month, and 654 million people each day use a mobile device to log in.
In Gdansk, Soletanche Polska completed an excavation which will contain the Second World War Museum. With the bottom of the excavation located 18 m below the groundwater table and an allowable residual water flow limited to 20 m³ per hour for the 14,600 m² footprint, this challenging project was completed in 8 months. In the absence of an impermeable layer at depth, Soletanche Bachy’s Polish subsidiary designed and built a temporarily anchored diaphragm wall. 195,000 m³ of soil was removed underwater by dredging, following which a 25,000m³ temporary concrete plug raft was poured under water. The plug was poured in 7 days without interruption at an average rate of pour of 150 m³ per hour. Today, this organisational achievement from Soletanche Polka’s teams is a world record for this process.
Las Tórtolas tailing dam

Reinforced Earth® retaining walls selected for the construction of both the upstream and downstream walls of the raised dam.

Stage 1 was completed in May 2014; when completed the downstream walls in both stages act as one composite retaining wall almost 22 m high.

NUVIA – PROTECTION OF SEALS BETWEEN BUILDINGS AT THE TAISHAN EPR (CHINA)

As part of the Taishan EPR product, NUVIA Protection has won the supply and technical support contract for the seals between buildings. Over 4 km of seals are required for each unit on the site. These seals must meet around ten functional criteria and have undergone numerous tests (fire, elongation, mechanical strength, etc.) to comply with the EPR specifications. This contract comes in addition to NUVIA’s other activities on unit 2, which include sealing the mechanical and electrical passageways, protecting the ventilation ducts, supplying fire dampers, protecting cableways and compartmenting the inter-vessel space.
Foreva®, a turnkey service for managing and maintaining of structures.

— February 2015 —