

# ■ Bridges



**FREYSSINET**



Replacement of suspension cables



# THE PROBLEMS

Whether concrete, metal, masonry or wood, bridges age and undergo changes over the course of time. Freyssinet offers its clients proven solutions for the repair, the protection and the strengthening of these structures.

## ■ FIELD OF APPLICATION

- Roadway bridges;
- Railway bridges;
- Canal bridges;
- Pedestrian bridges.

## ■ IDENTIFIED PROBLEMS

- Corrosion of steel elements;
- Concrete spalling and flaking;
- Concrete cracking;
- Concrete delamination;
- Partial destruction or failure of elements;
- Excessive deformation;
- Water infiltration;
- Water leaks and infiltrations.

## ■ NATURAL CAUSES

- Ageing of materials (steel, wood, concrete);
- Concrete cracking or spalling due to alkaline reaction;
- Concrete carbonation;
- Chloride penetration in the concrete cover;
- Chemical aggressions (polluted air, acid rain);
- Freezing/thawing cycles.

## ■ STRUCTURAL CAUSES

- Change of use (increase of live loads);
- Regulatory change (earthquake, wind);
- Design error, poor design or implementation;
- Material fatigue due to the wheel loads;
- Differential thermal expansion;
- Excessive creep;
- Excessive shrinkage and differential shrinkage;
- Missing expansion joints.

## ■ ACCIDENTAL CAUSES

- Fire;
- Excessive loading;
- Ground movements;
- Vibrations.

Slab reinforcement with prestressing bars



Zinc coating  
cathodic protection



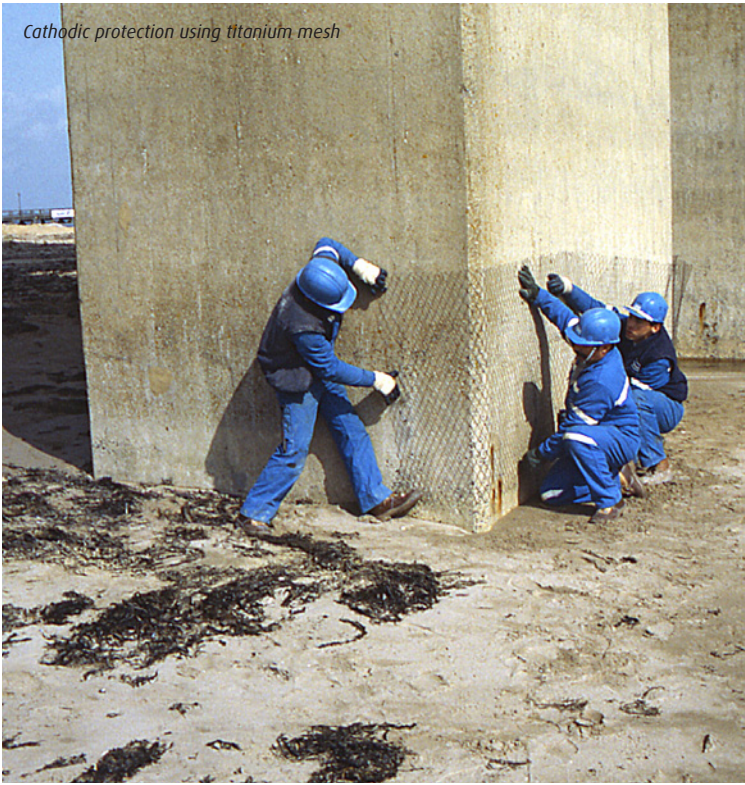
Reinforcement of  
underside of deck  
with Foreva®TFC



Freyssinet, with more than sixty years of experience, as a main contractor in specialized works, has developed the Foreva® offer, a turnkey service guarantee for the long-term enhancement of your structures.



Cathodic protection using titanium mesh



Pier reinforcement with shotcreting



Jacking of bridges



Replacement of expansion joints

# OUR SOLUTIONS

The Foreva® solutions enable Freyssinet to carry out repair and retrofit works in line with industry standards and good engineering practice while respecting the environment.

## ■ ASSISTANCE WITH THE STRUCTURAL DIAGNOSIS

## ■ ASSISTANCE WITH THE DESIGN

## ■ CONCRETE REPAIR

- Treatment of cracks
  - Resin and grout injection (**Foreva® TF Inject**)
  - Injection of cracks with water infiltration
- Concrete re-profiling
  - Patch repair (**Foreva® REP**)
  - Shotcrete (**Foreva® Shotcrete**)

## ■ PROTECTION OF REINFORCING STEELS

- Cathodic protection with galvanic anode:
  - Use of discrete anodes (**Foreva® GP Guard**)
  - Use of zinc coating (**Foreva® GP Zinc**)
- Cathodic protection with impressed current:
  - Use of discrete anodes (**Foreva® CP Tube**)
  - Use of anodic ribbons (**Foreva® CP Ribbon**)
  - Use of anodic meshes (**Foreva® CP Mesh**)
  - Use of conductive anodic coating (**Foreva® CP Coat**)
- Electro-chemical treatment of concrete
  - Realkalinization (**Foreva® PH+**)
  - Chlorides extraction (**Foreva® CL**)
- Surface Treatment
  - Use of Inhibitors of corrosion (**Foreva® Inhib**)
  - Protective coatings (**Foreva® Relastic 310**)
  - Water repellent impregnation (**Foreva® Fuge**)

## ■ STRENGTHENING WORKS

- Additional prestressing (Freyssinet products)
- Shotcrete (**Foreva® Shotcrete**)
- Carbon fiber bonded composite
  - Bidirectional and unidirectional fabrics (**Foreva® TFC**)
  - Pultruded laminate (**Foreva® LFC**)
  - Pultruded rod (**Foreva® RFC**)
- Metal and wood reinforcements
- Underpinning with micro-piles
- Load transfer using flat jacks (Freyssinet process)

## ■ PROTECTIVE COATINGS AND WATERPROOFING LININGS

- Polyurea spray coatings (**Foreva® Polyurea**)

Our specialist teams are on hand to help you identify the Foreva® solution that meets your requirements.



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Brazil  
Canada  
Chile  
Colombia  
French Guyana  
Mexico  
Panama  
Peru  
El Salvador  
United States of America  
Venezuela

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Cyprus  
Czech Republic  
Denmark  
Estonia  
France  
Hungary  
Iceland  
Ireland  
Italy  
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Lithuania  
Luxembourg  
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