



# Buildings



**FREYSSINET**

# 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.

## ■ AREAS OF APPLICATION

- Industrial or residential buildings;
- Office buildings;
- Communal facilities;
- Shopping centres;
- Car parks;
- Historic monuments.

## ■ IDENTIFIED PROBLEMS

- Corrosion of reinforcing steel,
- Concrete spalling and flaking,
- Concrete cracking,
- Concrete delamination,
- Partial destruction or breaking of elements,
- Excessive deformation.

## ■ NATURAL CAUSES

- Ageing of materials (steel, wood, concrete);
- Concrete cracking or spalling due to alkaline reaction;
- Concrete carbonation;
- Chloride penetration in the concrete coating;
- Chemical attacks;
- Freeze/thaw cycles.

## ■ STRUCTURAL CAUSES

- Change of use (increase in live loads, creation of openings);
- Regulatory change (earthquake, wind);
- Calculation error, poor design or implementation;
- Material fatigue, effects of rolling loads.

## ■ ACCIDENTAL CAUSES

- Fire;
- Excessive loads;
- Ground movements;
- Vibrations



Slab strengthening with additional prestressing



Floor strengthening with Foreva®TFC



Strengthening of wood structure



Balcony strengthening with additional prestressing

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.

Shotcrete strengthening



Underpinning with micropiles



Underpinning with Fondapieux



treatment of concrete strengthening with cathodic protection



# 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.



#### Americas

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

#### Europe

Belgium  
Bulgaria  
Cyprus  
Czech Republic  
Denmark  
Estonia  
France  
Hungary  
Iceland  
Ireland  
Italy  
Latvia  
Lithuania  
Luxembourg  
Macedonia  
Netherlands  
Norway  
Poland  
Portugal  
Romania  
Russia  
Serbia  
Slovenia  
Spain  
Sweden  
Switzerland  
Turkey  
United Kingdom

#### Africa and Middle East

Algeria  
Egypt  
Jordan  
Kuwait  
Morocco  
Oman  
Qatar  
Saudi Arabia  
South Africa  
Tunisia  
United Arab Emirates

#### Asia

Hong Kong  
India  
Indonesia  
Japan  
Macau  
Malaysia  
Pakistan  
Philippines  
Singapore  
South Korea  
Taiwan  
Thailand  
Vietnam

#### Oceania

Australia  
New Zealand

[www.freyssinet.com](http://www.freyssinet.com)

