

Solutions  
**Foreva**

**BUILDINGS**  
REPAIR, PROTECTION  
AND STRENGTHENING



I M P R O V E , P R E S E R V E , S E C U R E



**FREYSSINET**  
SUSTAINABLE TECHNOLOGY

# 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



# 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

## ■ PROTECTION WORKS

### Concrete repair and protection

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

### Protection of reinforcing steel

- Cathodic protection with galvanic anode:
  - Discrete (**Foreva® GP Guard\***)
  - Sprayed zinc coating (**Foreva® GP Zinc**)
- Cathodic protection with impressed current:
  - Discreet anodes (**Foreva® CP Tube**)
  - Anodic ribbons (**Foreva® CP Ribbon**)
  - Anodic meshes (**Foreva® CP Mesh**)
  - Conductive anodic coating (**Foreva® CP Coat**)
- Electro-chemical concrete repair
  - Realkalinization (**Foreva® PH\***)
  - Chlorides extraction (**Foreva® Cl**)
- Surface Treatment
  - Physical and chemical treatment with corrosion inhibitor (**Foreva® Inhib**)
  - Protective coatings (**Foreva® Relastic 300 and Foreva® Fuge 500**)

## ■ STRENGTHENING WORKS

- Additional prestressing (Freyssinet products)
- Shotcrete (**Foreva® Shotcrete**)
- Carbon fiber bonded composite
  - High modulus fabric (**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)

Underpinning with micropiles



Underpinning with Fondopieu



Treatment of concrete strengthening with cathodic protection



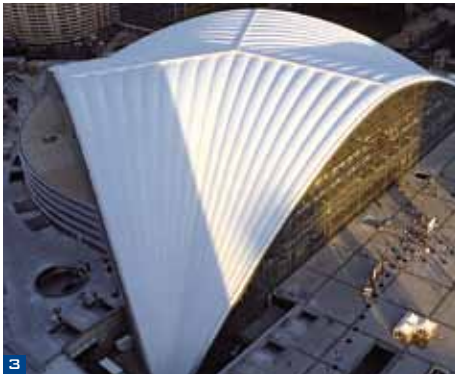
Our specialist teams are on hand to help you identify the Foreva® solution that meets your requirements.



1



2



3



4



5

1/Louvre Museum, Paris 2/Building on Jeanne d'Arc street, Paris 3/CNIT congress-exhibition centre, Paris La Défense 4/Museum of Contemporary Art, Toulouse 5/Thermal baths, Nancy



**FREYSSINET**  
SUSTAINABLE TECHNOLOGY

Head Office: 1 bis, rue du Petit Clamart 78140 Vélizy-Villacoublay - France  
Phone: +33 1 46 01 84 84 - Fax: +33 1 46 01 85 85

[WWW.FREYSSINET.COM](http://WWW.FREYSSINET.COM)

A SUBSIDIARY OF  SOLETANCHE FREYSSINET