











## 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.

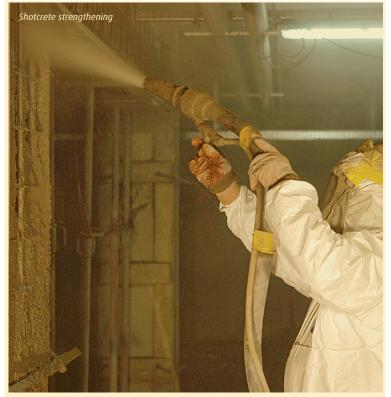
#### ■ STRUCTURAL CAUSES

- 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

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.









## **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<sup>-</sup>)
- 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

Estonia France Hungary Iceland Ireland Italy Latvia

Norway Poland Portugal Romania Russia Serbia Slovenia Spain Sweden Switzerland

Turkey United Kingdom

Czech Republic Denmark Lithuania Luxembourg Macedonia Netherlands

#### **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

#### Oceania

Thailand Vietnam

Australia New Zealand

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