



Solutions  
**Foreva**

**BRIDGES**  
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, steel, masonry or timber, bridges age and undergo changes over the course of time. Freyssinet offers its clients proven solutions for the repair, protection and strengthening of these structures.

## ■ FIELD OF APPLICATION

- Road bridges,
- Rail bridges,
- Pedestrian bridges,
- Stay cable bridges.

## ■ IDENTIFIED PROBLEMS

- Corrosion of steel elements leading to:
  - Concrete delamination,
  - Concrete spalling and flaking,
  - Concrete cracking,
  - Partial destruction or failure of elements,
- Excessive deformation,
- Water leaks and infiltrations.

## ■ NATURAL CAUSES

- Ageing of materials (steel, timber, concrete),
- Concrete cracking or spalling due to alkaline reaction,
- Concrete carbonation,
- Chloride penetration in the concrete cover,
- Chemical infiltration (polluted air, acid rain).

## ■ STRUCTURAL CAUSES

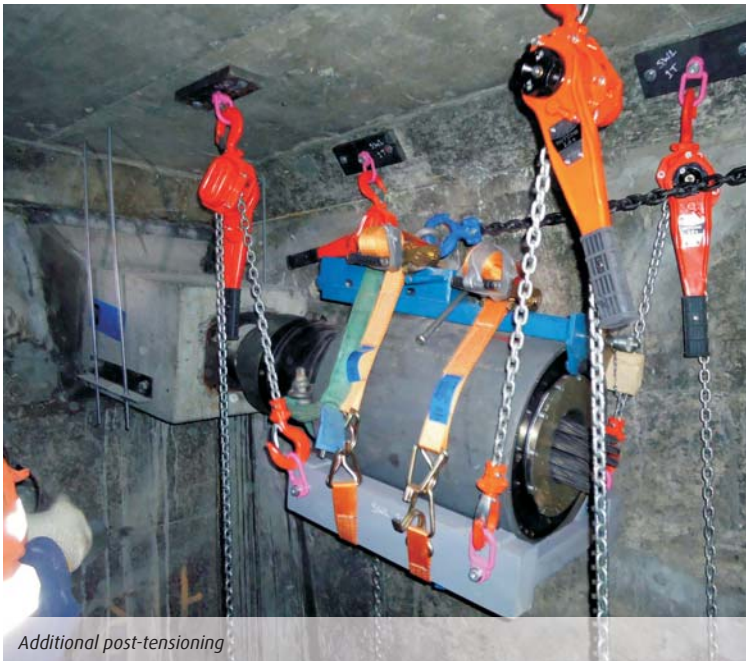
- Change of use (increase of live loads),
- Change of standards (seismic, environmental),
- Design error, poor design or construction,
- Material fatigue, effects of rolling loads,
- Differential thermal expansion,
- Excessive creep,
- Excessive shrinkage and differential shrinkage,
- Damaged bearings,
- Missing expansion joints.

## ■ OTHER CAUSES

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



Bridge jacking and specialised access system



Additional post-tensioning



Reinforcement with Foreva®TFC



Cathodic protection

Freyssinet, with more than sixty years of experience, as a main contractor in specialised works, has developed the Foreva® solution, 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

## ■ PROTECTION WORKS

### Concrete repair and protection

- Treatment of cracks
  - Resin and grout injection
  - Injection of cracks with water infiltration
- Concrete re-profiling
  - Patch repair
  - Shotcrete

### Protection of reinforcing steel

- Cathodic protection with galvanic anode:
  - Discrete anodes (**Foreva® GP Guard+**)
  - Zinc coating (**Foreva® GP Zinc**)
- Cathodic protection with impressed current:
  - Discrete anodes
  - Anodic ribbons (**Foreva® CP Ribbon**)
  - Anodic meshes (**Foreva® CP Mesh**)
  - Conductive anodic coating
- Electro-chemical treatment of concrete
  - Realkalisation (**Foreva® PH+**)
  - Chloride extraction (**Foreva® CL-**)
- Surface Treatment
  - Use of corrosion inhibitors
  - Protective coatings



Cathodic protection



Shotcreting



Jacking of bridges



Replacement of expansion joints

## ■ STRENGTHENING WORKS

- Additional post-tensioning (Freyssinet products)
- Shotcrete
- Carbon fibre bonded composites
  - Fabric (**Foreva® TFC**)
  - Laminate (**Foreva® LFC**)
  - Rod (**Foreva® RFC**)
- Metal and timber reinforcements
- Load transfer using flat jacks (Freyssinet process)

## ■ SPECIALISED ACCESS SYSTEMS

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



1/Carbon fibre strengthening 2/Bridge deck replacement 3/Bearing replacement 4/Bridge strengthening 5/Crack injection

#### SYDNEY

Level 3, 13-15 Lyonpark Road  
Macquarie Park NSW 2113  
Tel: +61 2 9491 7177

#### MELBOURNE

217 Arden Street  
North Melbourne VIC 3051  
Tel: +61 3 9321 1300

#### BRISBANE

6 Chapman Place  
Eagle Farm QLD 4009  
Tel: +61 7 3862 0100

#### PERTH

115 Radium Street  
Welshpool WA 6106  
Tel: +61 8 9251 1030

#### NEWCASTLE

271 Brunker Road  
Adamstown NSW 2289  
Tel: +61 2 4978 7806

#### CHRISTCHURCH

1220 Main North Road  
Christchurch 8083 New Zealand  
Tel: +64 3 903 2362



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