



Solutions
Foreva

**INDUSTRIAL
STRUCTURES**
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

All industrial structures age and undergo changes over time that may make them unsuitable for use. Freyssinet offers its clients proven solutions for the repair, the protection and the strengthening of these structures.

■ FIELD OF APPLICATION

- Silos,
- Hangars,
- Storage warehouses,
- Factories,
- Testing and research centers,
- Dams.

■ IDENTIFIED PROBLEMS

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

■ NATURAL CAUSES

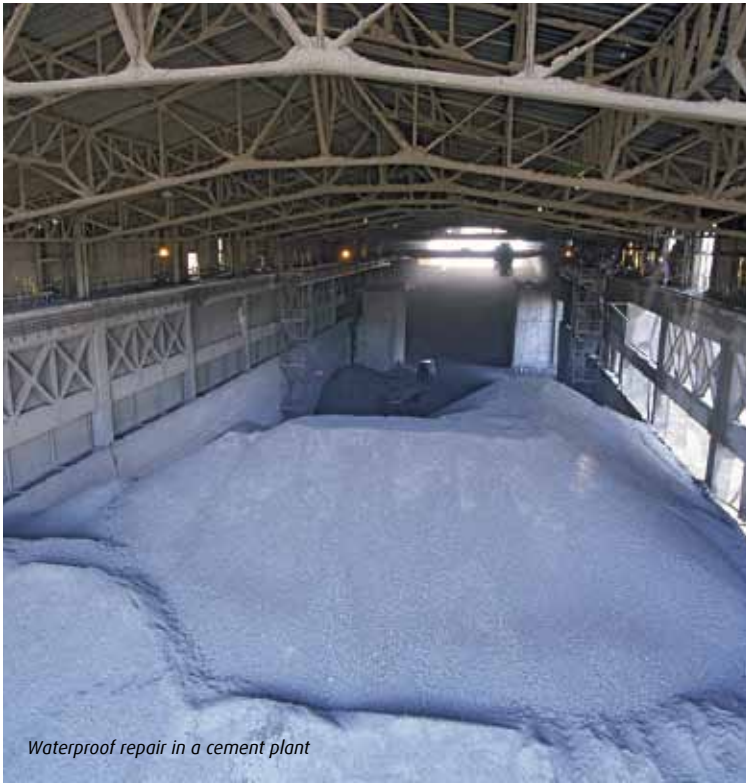
- Ageing of materials (steel, wood, concrete),
- Concrete cracking or spalling due to alkaline reaction,
- Concrete carbonation,
- Chlorides penetration in concrete cover,
- External chemical aggressions (polluted air, acid rain),
- Chemical aggressions due to stored products,
- Freezing/thawing cycles.

■ STRUCTURAL CAUSES

- Change in stored materials,
- Change of standards (wind, earthquake, safety),
- Design error, poor design or implementation,
- Material fatigue (moving wheel loads effects).

■ ACCIDENTAL CAUSES

- Fire,
- Explosion,
- Excessive loading (offset draining),
- Ground movements.



Waterproof repair in a cement plant



Cathodic protection with titanium mesh



Patch repair and re-profiling



Strengthening with FRP (Foreva® TFC) anchored by carbon braids

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.

Strengthening by additional prestressing monostrands



Columns repair by shotcreting



Silo strengthening with additional prestressing loops



Strengthening by Foreva®TFC

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
 - Patch repair (**Foreva® REP**)
 - Shotcrete (**Foreva® Shotcrete**)
- Sealants and waterproof coatings
 - Application of laminated epoxy coating (**Foreva® Reva**)
 - Hot polyurethane projection
 - Application of a hydraulic coating
 - Placing of shells and membranes (Polyolefin, PVC)

Protection of reinforcing steel

- 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 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)

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



1 / Repair of a harbour structure 2 / Strengthening of factory roof 3 / Strengthening of hot furnace 4 / Waterproofing of a water tank 5 / Repair of a cement plant



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