



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 compromise their fit for purpose use. Freyssinet offers its clients proven solutions for the repair, protection and strengthening of these structures.

■ FIELD OF APPLICATION

- Silos,
- Chimney stacks,
- Wharves and jetties,
- Bridges,
- Tunnels,
- Culverts.

■ IDENTIFIED PROBLEMS

- Corrosion of reinforcing steel leading to:
 - Concrete delamination,
 - Concrete cracking,
 - Concrete spalling and flaking,
 - Partial destruction or failure of elements.
- Under designed members,
- Water ingress.

■ NATURAL CAUSES

- Ageing of materials (steel, timber, concrete),
- Concrete carbonation due to alkaline reactions,
- Chloride penetration in concrete cover,
- External chemical attack (polluted air, acid rain, H₂S),
- Chemical attack due to stored products.

■ STRUCTURAL CAUSES

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

■ OTHER CAUSES

- Fire,
- Explosion,
- Excessive loading,
- Ground movements,
- Mechanical impact.



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
- Sealants and waterproof coatings
 - Application of laminated epoxy coating
 - Hot polyurethane projection
 - Application of a hydraulic coating
 - Placing of shells and membranes (Polyolefin, PVC)

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
 - Realkalinisation (**Foreva® PH+**)
 - Chloride extraction (**Foreva® CL-**)
- Surface Treatment
 - Use of corrosion Inhibitors
 - Protective coatings

■ STRENGTHENING WORKS

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



Strengthening by additional monostrand post-tensioning



Shotcreting



Replacement of timber elements



Strengthening with TFC

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



1



2



3



4



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1 /Impressed Current Cathodic Protection on steel wharf structure 2/Concrete repair 3/Carbon fibre installation 4/Impressed Current Cathodic Protection installation 5/Strengthening of a silo



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