



Solutions
Foreva

**WATER CIVIL
ENGINEERING
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 structures related to water works 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

- Water treatment and production plants;
- Tower tanks, partially or fully buried;
- Channels;
- Pipes;
- Sewer drains;
- Waste water treatment plants;
- Storage reservoirs.

■ IDENTIFIED PROBLEMS

- Corrosion of reinforcing or prestressing steel;
- Concrete spalling and flaking;
- Concrete leaching;
- Concrete cracking;
- Concrete delamination;
- Water leaks and infiltrations;
- Sealant deterioration;
- Partial destruction or failure of elements;
- Excessive deformation.

■ NATURAL CAUSES

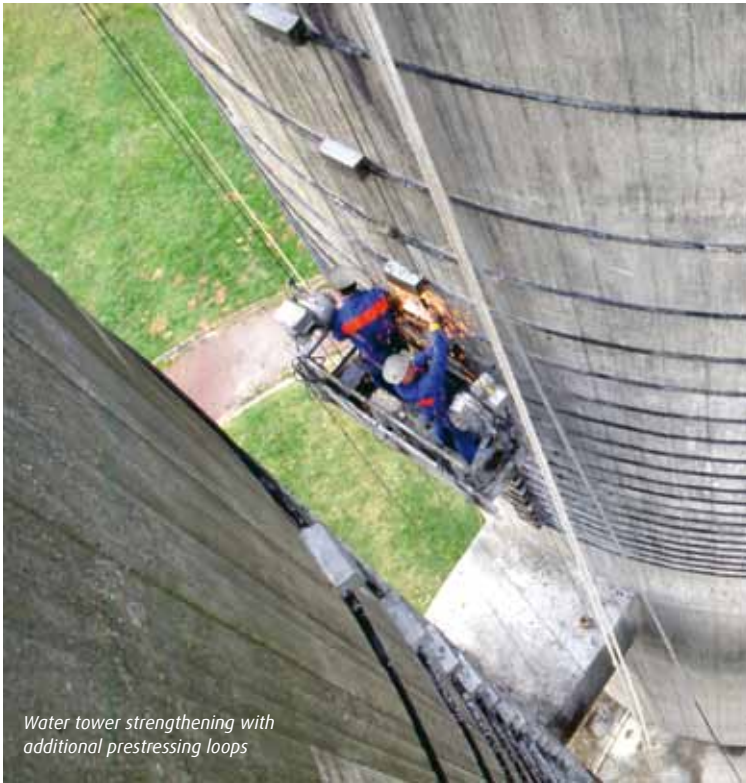
- Ageing of materials;
- Concrete cracking or spalling due to alkaline reaction;
- Concrete carbonation;
- Chloride penetration in concrete cover;
- External chemical aggressions (polluted air, acid rain);
- Chemical aggressions due to transported fluids;
- Freezing/thawing cycles;
- Thermal shocks.

■ STRUCTURAL CAUSES

- Use of unsuitable materials;
- Design error, poor design or implementation;
- Material fatigue (filling-draining cycles).

■ ACCIDENTAL CAUSES

- Excessive loading;
- Ground movements.



Water tower strengthening with additional prestressing loops



Vessel strengthening with additional prestressing



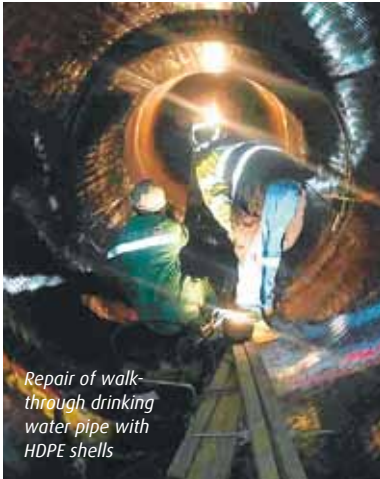
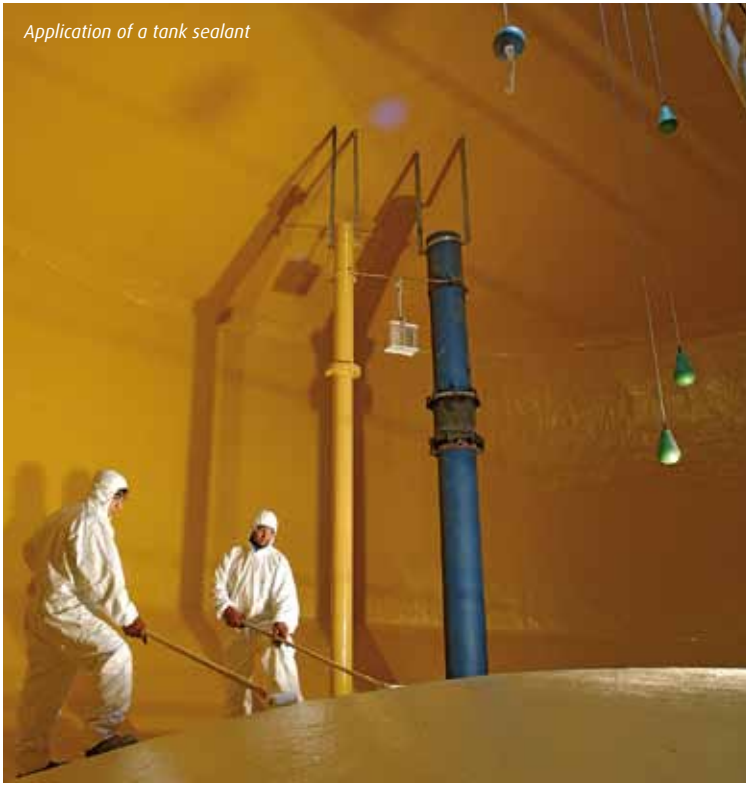
Channel waterproofing



Sealant application

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.

Application of a tank sealant



Repair of walk-through drinking water pipe with HDPE shells



Strengthening metal tank for earthquakes with Foreva®TFC



Chamber wall strengthening with shotcrete

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**)

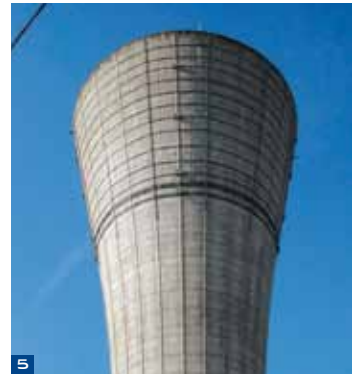
■ STRENGTHENING WORKS

- 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)

Freyssinet is AQUAPLUS certified.



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



1 /Water tower, Roissy Charles de Gaulle airport 2/Water tower, Versailles 3/Olivettes dam 4/Tortel reservoir, Paris 5/Pont de la Plante Water tower



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