

# Repair.



FREYSSINET

A structure lives, ages and changes over time. Structural repair is always a complex operation and must be just as carefully performed as new construction.

Corrosion  
Accident  
Aging  
Alteration  
Upgrade to standards

# Repair.

Protect  
Reinforce  
Maintain  
Improve  
Extend lifespan

We deliver solutions to protect, repair, reinforce and maintain buildings and engineering structures.



# Initially

In 1934, the just-completed maritime terminal in the north-western French port of Le Havre, supported by 10 metre piles, began to sink into a thick layer of clay. Clearly, the 575 metre long, 46 metre wide building, weighing 100,000 tonnes and designed to accommodate the famous ocean liner Normandie, was in danger of collapsing.

Eugène Freyssinet, a graduate of the iconic Polytechnique and Ponts et Chaussées engineering schools with a well-established reputation as the inventor of prestressing, immediately grasped the problem: the use of short piles in unstable terrain. He proposed a bold and innovative plan to save the terminal. It consisted in using prestressing to assemble some 700 piles with lengths of 25 to 30 metres and driving them down to the solid layers of subsoil in order to consolidate the structure's foundations.

The operation succeeded, bringing Eugène Freyssinet lifelong fame around the world. It also marked his start in the field of structural repair, one of Freyssinet's two main fields of activity alongside construction.

Every year, around the world, Freyssinet carries out some 3,000 structural repair projects, to which we bring our exceptional expertise and high-performance technical solutions.

This brochure describes them.

## 6 business areas, 7 areas of application

Freyssinet delivers suitable techniques to protect, repair, reinforce and maintain the structures that are a crucial part of daily life, including water towers, apartment buildings and industrial facilities.



Concrete repair and protection



Concrete structural reinforcement



Reinforcement protection



Underpinning



Specialist maintenance



Wood, stone, metal structure repair

	Concrete repair and protection	Concrete structural reinforcement	Reinforcement protection	Underpinning	Specialist maintenance	Wood, stone, metal structure repair
 Bridges and engineering structures, dams	✓	✓	✓	✓	✓	✓
 Public and Private buildings	✓	✓	✓	✓	✓	✓
 Industrial structures	✓	✓	✓	✓	✓	✓
 Marine and river structures	✓	✓	✓	✓	✓	
 Water engineering structures	✓	✓	✓	✓	✓	
 Tunnels and arches	✓	✓	✓	✓		
 Historical monuments	✓	✓	✓	✓		✓

# Turnkey solutions

Freyssinet is a general contractor offering its clients comprehensive, customised structural analysis, repair, reinforcement and maintenance.

## Dedicated repair teams

At Freyssinet, structural repair is a fully-fledged business activity. For this reason, dedicated teams are exclusively assigned to it in each country where we have a location. They are trained in technical solutions and products and work on a broad and constantly expanding range of business areas, from industrial silos to wooden beams, bridges and civil engineering structures.

## Comprehensive service

Freyssinet delivers a comprehensive integrated solution covering analysis, repair, reinforcement and maintenance of all types of structures and provides a guaranteed result rather than a mere product. To cover the entire structural repair chain, Freyssinet created the Foreva® label, under which it develops the full range of certified products and their implementation protocols.

## Customised service

To adapt to the structures entrusted to it and to roll out customised solutions meeting the its clients' needs, Freyssinet invests heavily in R&D. Its most iconic structural repair solutions, such as additional prestressing, shotcrete, cathodic protection and TFC®, a carbon fibre used to reinforce concrete structures, are employed throughout the world.



# The Foreva® philosophy

The Foreva® label brings together the full range of Freyssinet structural repair activities and solutions. From analysis to engineering and execution, the label guarantees that Freyssinet clients receive customised service meeting their needs.

## Solutions for all types of structure

Foreva® solutions exist for all types of structure requiring repair, reinforcement or adaptation to a new use that may involve new loads, including residential, industrial and office buildings, car parks, bridges and tunnels.

## Quality guidelines

Freyssinet's strength lies in its rigorous compliance with quality guidelines applying to every stage of its work, from analysis of existing pathologies to repair using Foreva® solutions. This approach guarantees the quality and durability of the solutions selected. To ensure they are implemented in accordance with best practices, our production teams receive many hours of training every year.

## Foreva® certified products

The repair solutions developed by Freyssinet use Foreva® certified products developed in our design offices. These products, including mortar, carbon fibre, resins and anodes, are selected for their performance and used day-to-day on our worksites around the world. They meet the highest standards and undergo extensive testing before they are installed.

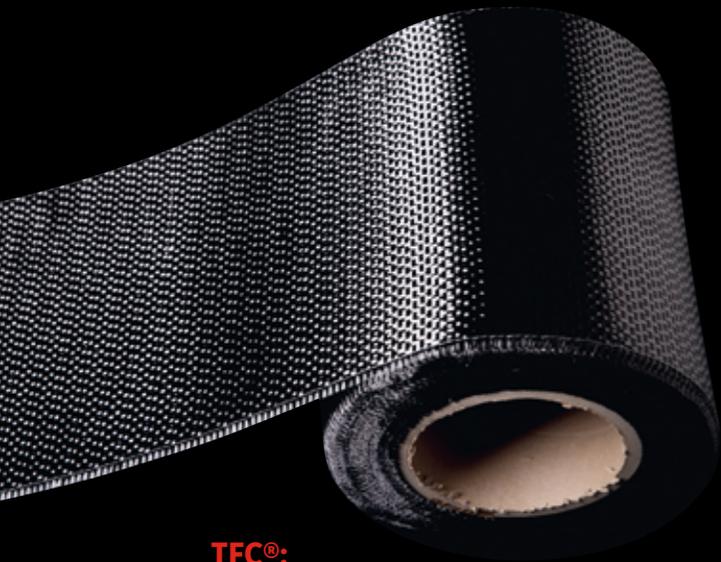
## Customised service

Because each structure is unique, it requires bespoke solutions. Freyssinet applies this principle to new buildings as well as old buildings for which no as-built drawings exist. An in-depth analysis of the damage is carried out for each project so as to propose the right reinforcement or repair solution.



# Foreva® products

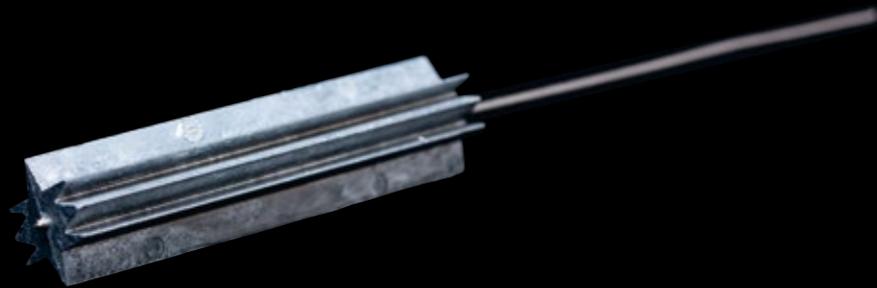
For each Foreva® solution, Freyssinet develops and manufactures specific products suited to the client's needs. These products undergo a long series of tests to ensure that they meet the required quality level and the highest standards.



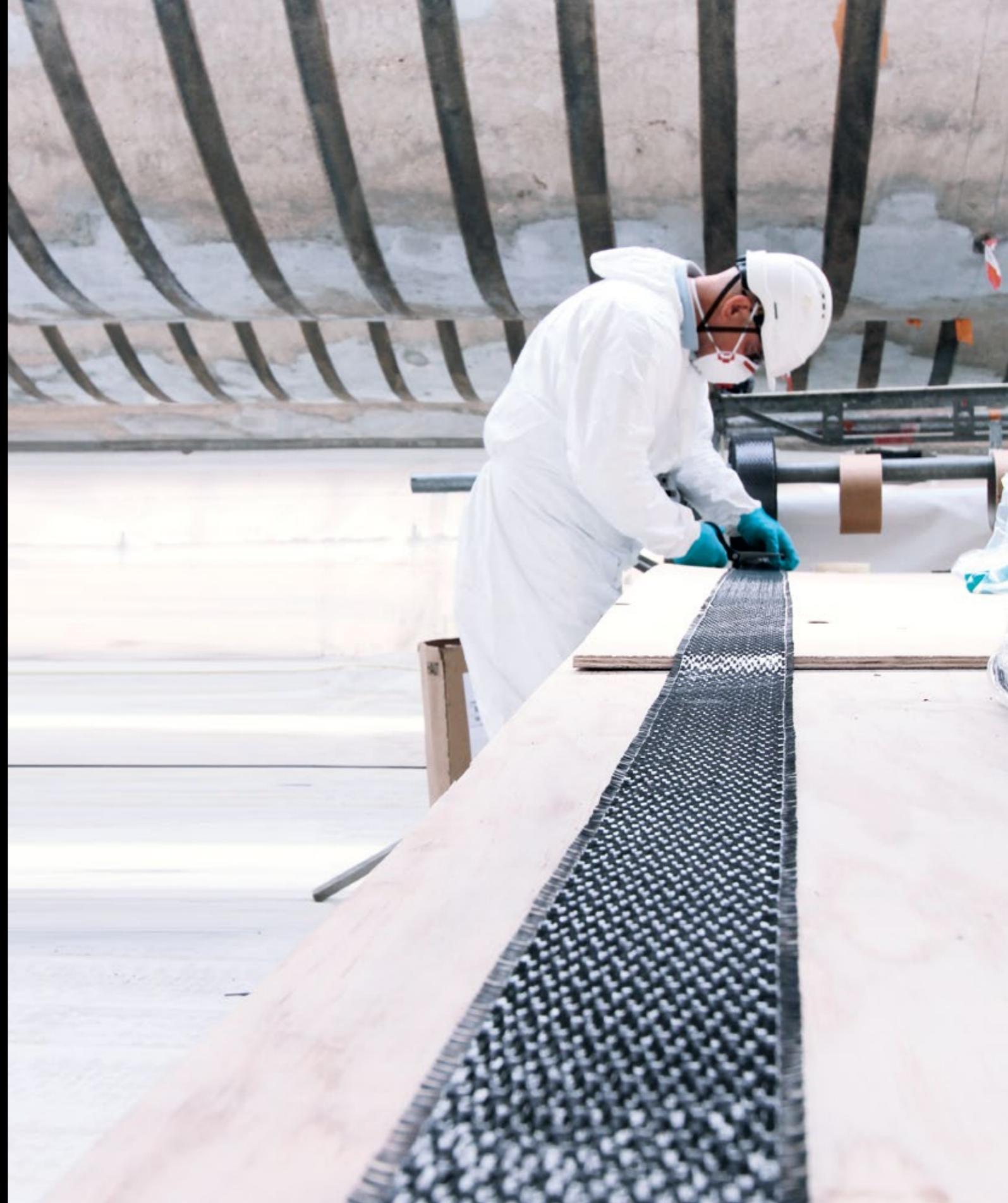
**M140 Foreva® mortar:**  
a water-based, fibre-reinforced quick-setting mortar with compensated shrinkage, used for levelling and shape reconstruction during the winter months.



**TFC®:**  
the benchmark product used to reinforce concrete. Since the material was introduced, Freyssinet has continuously adapted it and now offers a range of TFC® products suited to every need.



**Galvastar anodes:** the cathodic protection and prevention solution developed by Freyssinet for passive concrete reinforcements and prestressing. The anodes are inserted into the concrete facing and interconnected to form a comb-like arrangement.





## Rigorous analysis

Freyssinet's expert engineers, supported by its international design office, perform an exacting analysis of the degree of pathology in all types of structures to ensure the most suitable and durable solution.



## Guaranteed results

Freyssinet's people, including engineers, skilled workers and foremen, are experts in their field and respected as such throughout the world. They regularly undergo rigorous training programmes to update their expertise.



## State-of-art technologies

Freyssinet develops state-of-the-art technologies that optimise the quality, delivery time and cost of its solutions so that repairs of unrivalled quality can be completed within potentially shorter timeframes and at reduced cost.

## A global network

Because it has locations on five continents and because the head office and the subsidiaries work closely with each other, Freyssinet is able to repair structures around the world using the same techniques and know-how.



# Structural repair process

Freyssinet works as general contractor or subcontractor to safeguard a building or adapt a structure to a new use or new regulatory requirements.

We offer comprehensive, customised service. The most comprehensive process starts with identification of pathologies and continues after handover with follow-up, maintenance and monitoring.



## 1. Identification

The client presents the structure and its pathologies to the local Freyssinet specialists.



## 2. Investigation & diagnosis

Freyssinet specialists work at the site, using archive documents relating to the structure, to perform the studies and analyses required to devise the technical solutions.



## 3. Development of technical solutions

Based on the information provided by the client and the Freyssinet specialists, the technical teams work out the suitable repair solution or solutions for the structure.



## 4. Implementation

Trained and dedicated worksite teams methodically and precisely implement the Freyssinet repair solutions. Our experience with construction\* enables us to deliver extremely technical works that few providers can handle.



## 5. Handover

Client satisfaction is a core focus; we deliver projects that comply with the client's specifications and enable the client to operate the structure safely.



## 6. Monitoring & maintenance

At the client's request, Freyssinet can carry out structural monitoring and maintenance operations.

## SAFETY

Preventing risks and reducing the number of accidents

Our goal is to become the safety benchmark in the structural repair sector.



### Our commitments

- 1 People are at the heart of the company and constitute its main asset.
- 2 General management hold primary responsibility for safety and safety leadership.
- 3 Training is a crucial tool for enabling everyone to adopt our safety culture.
- 4 Safety is central to each stage of the construction project.



### Our principles

- Work with the stakeholders.
- We methodically plan our work.
- We ensure that the environment is safe.
- We provide efficient equipment.
- We identify and mitigate dangerous situations.
- We train our people to prevent accidents.

SECURITY

## Testimony

[...] Thanks for the hard work and excellent cooperation by your team over the past few years. The works have been conducted in a very professional manner. [...]

I visited the site on a number of occasions and witnessed your teams work in the tunnels and was very impressed by the organization and attitude of all involved.

**Charles Hoskins**

**Senior Director, SPT**

Project: Glasgow Subway Tunnel Lining



**EWIJK BRIDGE**  
The Netherlands

Freyssinet applied its repair solutions to the Ewijk Bridge on an extremely busy motorway in the east of the Netherlands. After replacing all the locked-coil cables and old saddles with cohesive strand cables and multitube saddles, the teams carried out additional reinforcement work on the bridge's piers, dampers and girders supporting the saddles.

# PORTFOLIO



## ELBEUF CHURCH France

Listed as a historical monument, Elbeuf Church (Normandy) was closed to the public after some of its arches collapsed. They have been reinforced with resin concrete and carbon fibre fabric, linked on either side of the arch with carbon braids.



## CITÉ RADIEUSE France

In Marseille, Freyssinet worked on the Cité Radieuse, built by architect Charles-Édouard Jeanneret, known as "Le Corbusier", between 1947 and 1952. The building, damaged by fire, required substantial concrete structural repair and reinforcement work.





**PUYMORENS  
TUNNEL**  
France

The Puymorens tunnel at the French-Spanish border underwent a major upgrade. A full range of fire protection systems – thermal protection, refuges and evacuation tunnel – were installed in a project coordinated by Freyssinet, which was in charge of the design-build safety improvement programme.



**AYALA BRIDGE**  
Philippines

Freyssinet carried out a design-build project on the Ayala Bridge in the heart of Manila, rehabilitating the structure, substructures, foundations, road surfacing and access viaducts. The work notably included the design and implementation of earthquake protection systems.



**TEILLET  
RESERVOIR**  
France

Between January and April 2016, Freyssinet carried out prestressing and resin-based waterproofing work on two 7,000 m<sup>3</sup> tanks at the Teillet water treatment plant in the Tarn region.



**GOLDEN BAY**  
New Zealand

Freyssinet successfully repaired the silos at the oldest cement plant in New Zealand, involving remedial work to address cracking and flaking issues, concrete repairs, application of a protective coating and prestressing to structurally reinforce the silos.



Since 2016, the teams at Freyssinet have been monitoring and carrying out weekly maintenance on the pipelines used to transport petroleum products from the Kurnell refinery to the different port terminals in Newcastle. Freyssinet has demonstrated its technical expertise in concrete repairs and cathodic protection.



# Contact our specialists

at [freyssinet.com/implantations](https://freyssinet.com/implantations)



## Freyssinet, a subsidiary of the Soletanche Freyssinet Group

As the world leader in soil (Soletanche Bachy, Menard), structural (Freyssinet, Terre Armée) and nuclear (Nuvia) engineering and digital solutions and consulting (Sixense), the Soletanche Freyssinet Group brings together an unparalleled array of expertise in these areas. With more than 22,000 employees, the Group operates in more than 80 countries around the world.

# Let's work together.



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