



The benchmark  
for specialised civil engineering



# A prestigious Group and brands

**The Freyssinet Group brings together a range of expertise unequalled in specialised civil engineering.** The Group delivers high value added solutions in two major fields: structures and soils. Civil engineering structures, high-rise buildings, industrial sites, platforms, transport infrastructure, etc., the Group is involved in construction, refurbishment and prevention of deterioration of all types of building and civil engineering works. The Freyssinet group has been involved over the past 70 years in significant projects on all five continents. Today it is a group of companies each international benchmark in their specialised field: Freyssinet, a world leader in prestressing, stay cables and strengthening of structures; Reinforced Earth, a world leader in MSE (Mechanically Stabilised Earth) walls; Ménard Soltraitements, soil improvement specialists. Increasingly involved in sustainability, the Freyssinet Group is stepping up initiatives, to improve environmental protection on construction sites as well as strengthen its policy on social responsibility. Putting people at the core of the organisation, the Freyssinet Group has thus been committed to active steps towards risk prevention and safety for many years. Freyssinet is a subsidiary of VINCI Construction, the market leader in France and a major player worldwide in construction and civil engineering.

4,000 employees

6,000 projects a year in over 100 countries



Reinforced Earth





# Client-oriented expertise

Committing its expertise in the service of projects and clients defines the Freyssinet Group. It designs and implements solutions that are technically and economically optimised. The Freyssinet Group brings together assets that add value and contribute to project success.

## **Strong engineering capabilities of companies in the Group**

Most often involved from project conception, the Freyssinet Group works closely with clients in analysing their objectives and in proposing solutions that incorporate all the local requirements. These answers are provided by innovations and know-how that are spread across subsidiaries and underline the overall expertise of the Group.

## **The quality of exclusive products and processes developed by the Group.**

Achieving the highest technical performance and durability standards, the Group's products and processes are positioned at the highest level in the market, as exemplified by Freyssinet stay cables and expansion joints, Reinforced Earth retaining walls and Ménard Soltraitemement compaction techniques.



#### **The expertise of the “engineer/contractor”**

The Freyssinet Group is involved throughout the entire project, value adding in design, examining construction methods, engineering, equipment supply and works implementation. The Group's engineering contractor culture guarantees viable and durable solutions that utilise the Group's insight and expertise to address the particular constraints and opportunities to each situation.

#### **Team commitment**

The Group's expertise goes hand-in-hand with the professionalism of its teams. Across a diverse range of professions and locations, the men and women of Freyssinet Group share values that combine the quest for technical excellence and a sense of service. They are proud to help achieve clients' goals by devising and providing solutions that meet all their requirements including schedule, cost and quality.

# The innovation gene

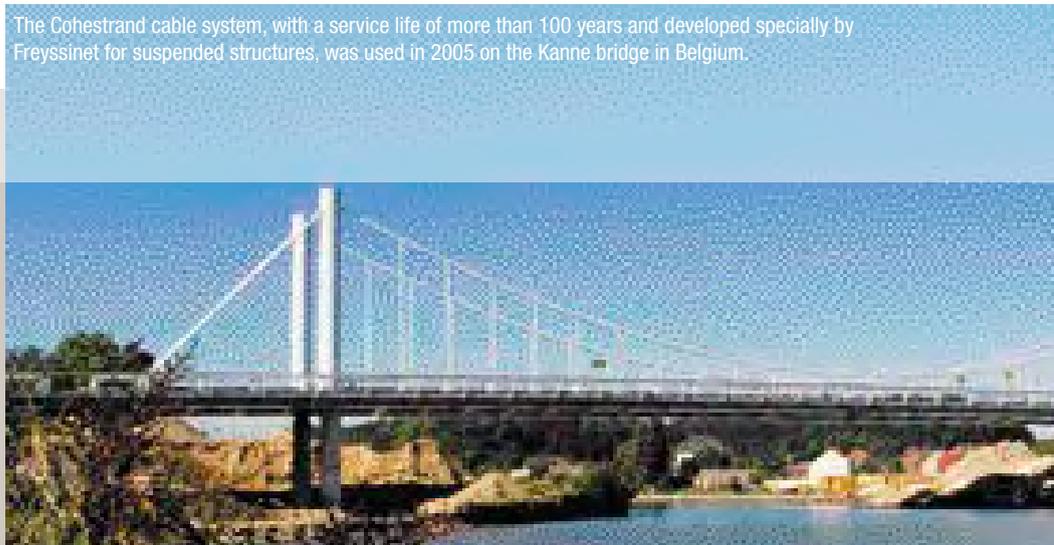
Innovation is in the Freyssinet Group's genes. Since Eugène Freyssinet invented prestressed concrete in the 1920s, the Group has based its growth on dynamic innovation, illustrated by a number of technological advances that have changed the civil engineering world. The Group maintains the pioneering spirit of its founders by implementing and investing heavily in an active research and development policy and working closely with research laboratories and specialist universities.

**Evidence of this innovative drive can be found in the constant enhancement of the Group's expertise, to the benefit of its clients.** Stay cables, suspension cables, restoration of original material properties, maintenance of structures, reinforcement and soil improvement..., the Group develops exclusive products and processes in all its fields of operation – resulting in 200 patents over the past two decades.

Mars (Mass Release System), developed by Ménard Soltraitement optimises soil compaction energy.



The Cohestrand cable system, with a service life of more than 100 years and developed specially by Freyssinet for suspended structures, was used in 2005 on the Kanne bridge in Belgium.



Several hundred thousand square metres of land reclaimed from the sea have been consolidated in the port of Kwang Yang (South Korea) using the Menard Vacuum process.

Unaffected by corrosion, the Omega synthetic connection guarantees retaining wall durability regardless of the nature and environment of the backfill.



## Some recent innovations

### STRUCTURES

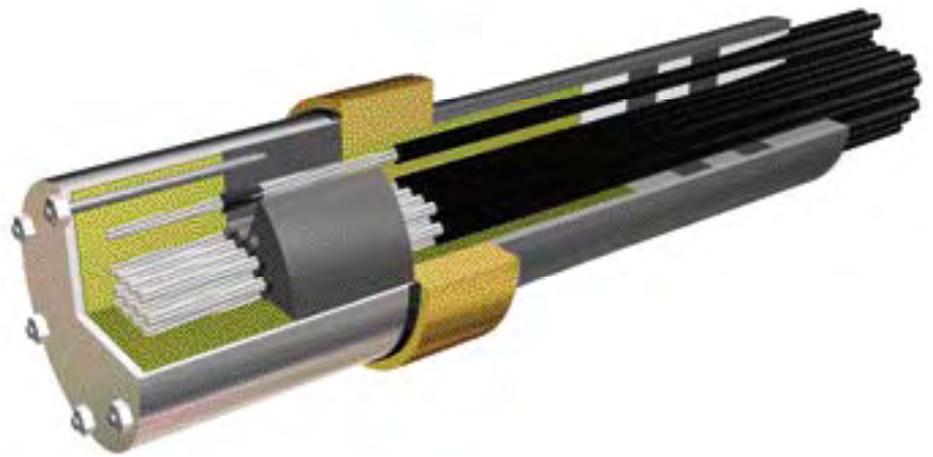
- Carbon fibre cables for stay cables and prestressing
- Cohestrand, the bonded strand for suspension bridges, prestressing and anchor tie rods
- WM expansion joints for heavy traffic
- Régébéton concrete treatment
- Transpec shock transmission system
- Carbon fibre fabric (TFC) for structural strengthening

### SOILS

- MARS system, the automatic release of weights to optimise the efficiency of soil compaction (Ménard Soltraitement)
- Bi-modulus columns, inclusion of rigid piles capped with stone columns (Ménard Soltraitement)
- Controlled modulus columns (Ménard Soltraitement)
- Menard Vacuum atmospheric consolidation process (Ménard Soltraitement)
- Omega connections (Reinforced Earth)
- TechSpan arches (Reinforced Earth)
- HA Ladder reinforcement strips for retaining walls (Reinforced Earth)



Along with research on groundbreaking processes, innovation is also day-to-day work to maintain product quality and performance at the highest level. Here, a prestressing anchor block is being checked at Freyssinet's PPC factory.



Autoripage uses a cable and ram arrangement to install a structure under a railway in just a few hours.



Made up of two half-sections in precast concrete, TechSpan arches are a quick and economical means of building bridges for road, rail or river crossing.

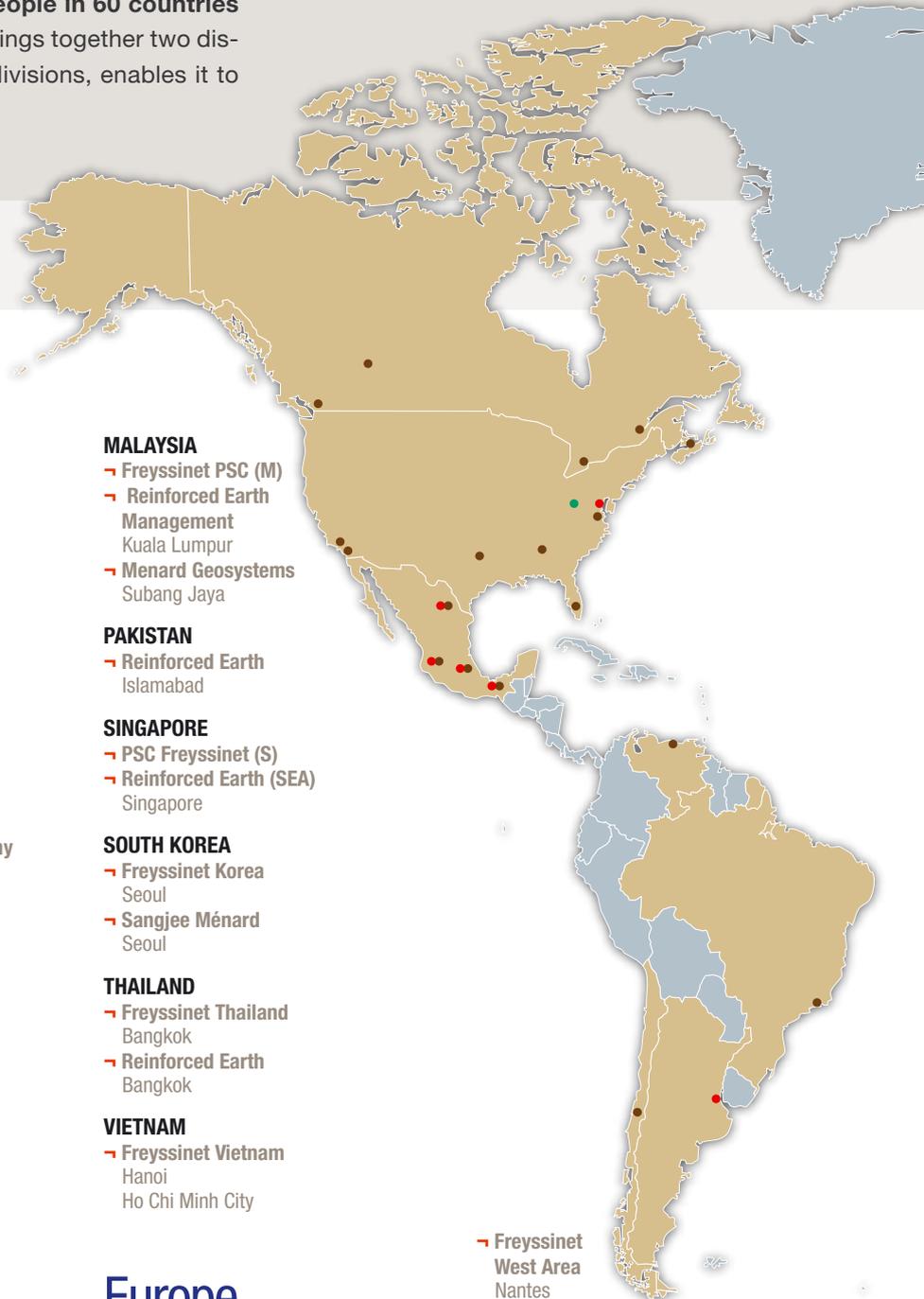


As a repair and maintenance specialist, Freyssinet has exclusive techniques available – cathodic protection, the Régébéton process – to neutralise or halt corrosion in concrete reinforcement.

# The Freyssinet Group Worldwide

As an international group, Freyssinet employs 4,000 people in 60 countries across five continents. The overall organisation, which brings together two disciplinary divisions (soils and structures) and geographic divisions, enables it to combine strong local roots with a worldwide expertise.

- Freyssinet locations
- Export countries
- Reinforced Earth
- Freyssinet
- Ménard Soltraitements



## Africa and Middle East

### ALGERIA

- Freyssinet International & Cie Algérie  
Algiers

### EGYPT

- Freyssinet Egypt  
Cairo

### KUWAIT

- Freyssinet International & Co.  
Kuwait City

### MOROCCO

- Freyssinet International & Cie Maroc  
Rabat

### SOUTH AFRICA

- Freyssinet Posten  
Johannesburg  
Cape Town  
Durban
- Reinforced Earth  
Johannesburg

### UNITED ARAB EMIRATES

- Freyssinet Middle East  
Dubai
- Freyssinet Gulf  
Dubai
- Freyssinet-Menard Northern Emirates  
Sharjah
- Freyssinet-Menard Qatar  
Doha

### CHILE

- Tierra Armada  
Santiago

### MEXICO

- Freyssinet de México –  
Tierra Armada  
Mexico DF  
Guadalajara  
Monterrey  
Villahermosa

### UNITED STATES

- The Reinforced Earth Company  
Lakeforest, CA  
Norcross, GA  
Eules, TX  
Vienna, VA  
Orlando, FL
- Retained Earth  
San Diego, CA  
Woodbridge, VA  
Melbourne, FL
- DGI-Menard  
Bridgeville, PA
- Freyssinet  
Sterling, VA

### VENEZUELA

- Tierra Armada  
Caracas

### MALAYSIA

- Freyssinet PSC (M)
- Reinforced Earth Management  
Kuala Lumpur
- Menard Geosystems  
Subang Jaya

### PAKISTAN

- Reinforced Earth  
Islamabad

### SINGAPORE

- PSC Freyssinet (S)
- Reinforced Earth (SEA)  
Singapore

### SOUTH KOREA

- Freyssinet Korea  
Seoul
- Sangjee Ménard  
Seoul

### THAILAND

- Freyssinet Thailand  
Bangkok
- Reinforced Earth  
Bangkok

### VIETNAM

- Freyssinet Vietnam  
Hanoi  
Ho Chi Minh City

- Freyssinet West Area  
Nantes

- Freyssinet East Area  
Nancy

- Freyssinet South-West Area  
Toulouse

- Freyssinet South-West Area  
Aquitaine Branch  
Bordeaux

- Freyssinet Rhône-Alps Area  
Lyons

- Freyssinet South-East Area  
Marseilles

- STTP  
Lyons

- MTS  
Macon

- JMB Méthodes  
Vélizy

- Salvarem  
Pierrelatte

- Mecatiss  
Morestel

## America

### ARGENTINA

- Freyssinet Tierra Armada  
Buenos Aires

### BRAZIL

- Terra Armada Ltda  
Rio de Janeiro

### CANADA

- Reinforced Earth Company  
Edmonton  
Vancouver  
Toronto  
Quebec  
Truro

## Asia

### HONG KONG

- Freyssinet Hong Kong
- Reinforced Earth Pacific  
Hong Kong

### INDONESIA

- PT Freyssinet Total Technology  
Jakarta

### JAPAN

- Freyssinet Kokyuto Kogen
- Terre Armée Kokyuto Kogen  
Tokyo

### MACAU

- Freyssinet Macau Limited  
Macau

## Europe

### BELGIUM

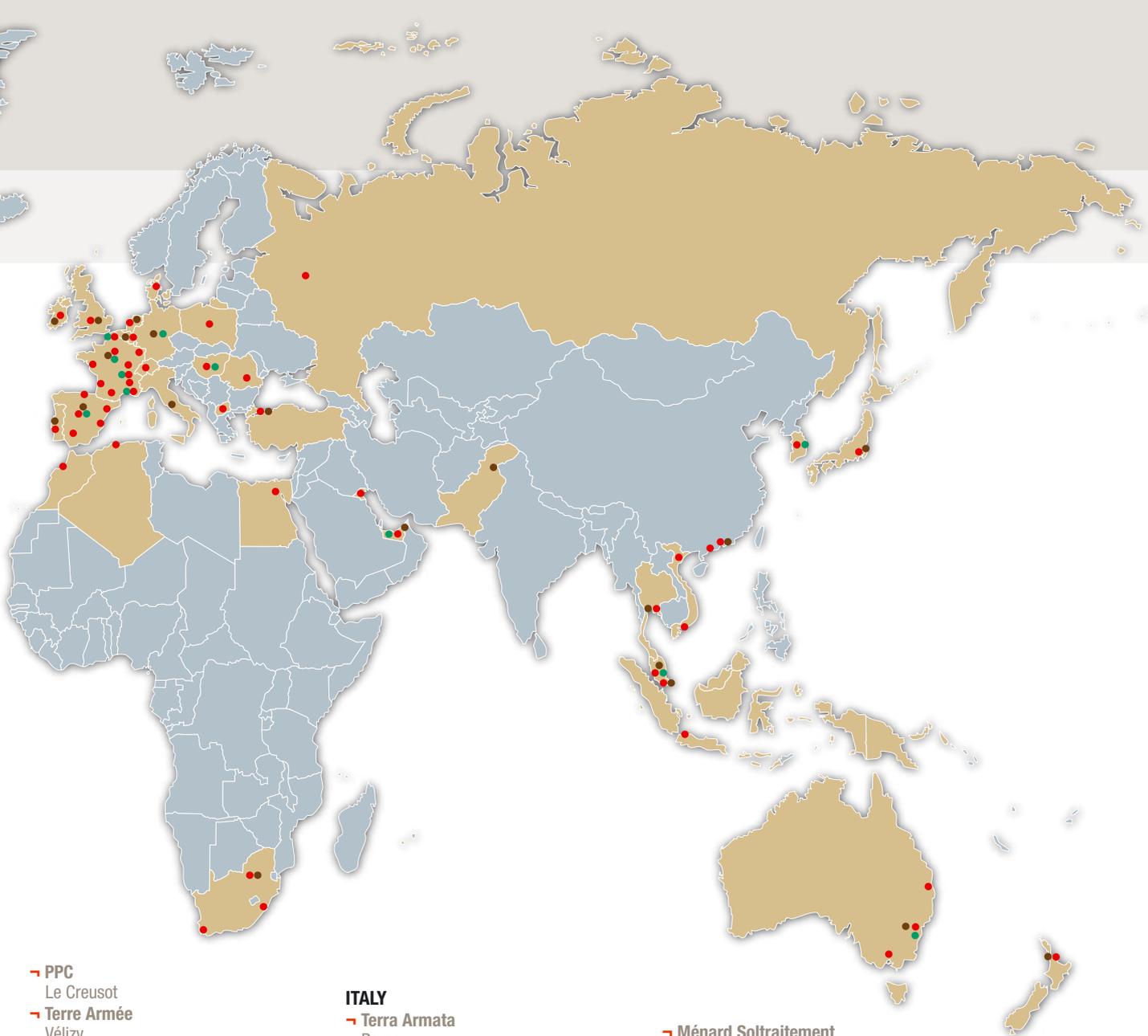
- Freyssinet Belgium
- Terre Armée Belgium  
Vilvoorde

### DANEMARK

- A/S Skandinavisk Spaendbeton  
Vaerloose

### FRANCE

- Freyssinet international & Cie
- Freyssinet France  
Vélizy
- Freyssinet NTS  
Marseilles
- Freyssinet Paris Area  
Palaiseau
- Freyssinet North Area  
Lille



- **PPC**  
Le Creusot
- **Terre Armée**  
Vélizy
- **Ménard Soltraitement**  
Nozay  
Lille  
Lyons  
Marseilles

- FYROM**
- **Freyssinet Balkans**  
Skopje

- GERMANY**
- **BVT Dyniv**
- **Bewehrte Erde**  
Seevetal

- HUNGARY**
- **Pannon Freyssinet**  
Budapest
- **Ménard Soltraitement**  
Budapest

- IRELAND**
- **Freyssinet Ireland**
- **Reinforced Earth Company Ireland**  
Kildare

- ITALY**
- **Terra Armata**  
Rome

- POLAND**
- **Freyssinet Polska**  
Milanówek

- PORTUGAL**
- **Freyssinet - Terra Armada**  
Lisbon

- ROMANIA**
- **Freyrom**  
Bucharest

- RUSSIA**
- **Freyssinet International & Cie**
- **Fratom**  
Moscow

- SPAIN**
- **Freyssinet**  
Barcelona  
Madrid  
San Sebastian  
Seville  
Valencia

- **Ménard Soltraitement**  
Madrid
- **Tierra Armada**  
Madrid

- SWITZERLAND**
- **Hebetec Engineering**  
Hindelbank
- **Freyssinet**  
Moudon

- THE NETHERLANDS**
- **Freyssinet Nederland**
- **Terre Armée**  
Waddinxveen

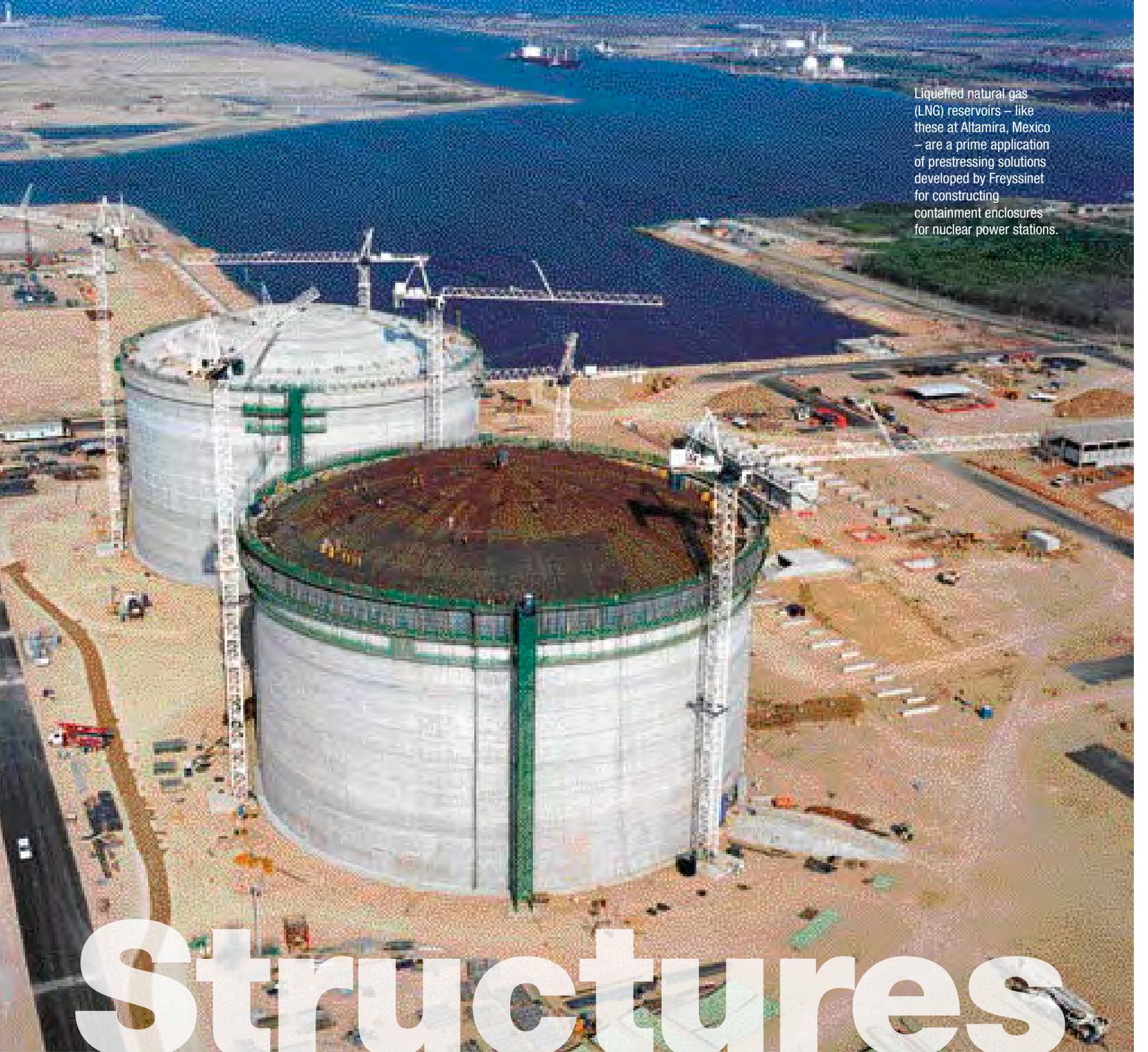
- TURKEY**
- **Freysas**
- **Reinforced Earth**  
Istanbul

- UNITED KINGDOM**
- **Corrosion Control Services**
- **Freyssinet**
- **Reinforced Earth Company**  
Birmingham

## Oceania

- AUSTRALIA**
- **Austress Freyssinet**  
Brisbane  
Melbourne  
Sydney
- **Austress Menard**  
Brisbane  
Sydney
- **The Reinforced Earth Company**  
Sydney

- NEW ZEALAND**
- **Freyssinet New Zealand**
- **Ménard New Zealand**
- **Reinforced Earth**  
Auckland



Liquefied natural gas (LNG) reservoirs – like these at Altamira, Mexico – are a prime application of prestressing solutions developed by Freyssinet for constructing containment enclosures for nuclear power stations.

# Structures

**Freyssinet operates in construction, repair and maintenance of structures for all purposes:** transport (bridges, tunnels), industry (reservoirs, silos, offshore platforms), commercial and retail (hypermarkets, warehouses), high-rise buildings, historic monuments, etc. Relying on its historic know-how in prestressing and structural cables, the Group has developed a full range of innovative solutions to support its clients: project engineering and planning, construction methods and structural fittings, and finally providing monitoring devices and systems, if required. These solutions are exemplified in numerous major prestigious contracts throughout the world.



The Bono bridge built in 1840 in the Morbihan region of France, was completely refurbished by Freyssinet in 2005.

## Benchmark solutions proven in multiple project implementations worldwide



A specialist in heavy lifting, Freyssinet lifted the mobile rigs for the Centenario bridge to a height of over 70m using cables. This was the second cable stayed bridge to cross the Panama Canal.



The A.B. Ravenel Jr bridge in the US was equipped by Freyssinet with internal and external shock absorbers to stabilise the structure.



Prestressing is also beneficial in building and Freyssinet offers an entire range of solutions for this application.

## Construction

The product of 65 years of continuous R&D effort, Freyssinet solutions meet the highest standards of modern civil engineering and major building projects.

### PRESTRESSING

- Internal and external prestressing tendons for civil engineering structures, buildings (prestressed beams and floors), nuclear containment enclosures, liquefied natural gas (LNG) reservoirs, water towers, silos
- Solutions applied: system C, system C – cryogenic and electrically isolated, systems E and F – anchors and flat ducts for buildings, system X – circular prestressing; offshore platforms

### DECK CONSTRUCTION

- Incremental launching, sliding and rotation; progressive, cantilever construction; precast beams; industrial-scale subways; Autoripage®; Autofonçage®

### CABLED STRUCTURES

- Freyssinet high-performance stay cables: mechanical fatigue, corrosion resistance; implementation flexibility (Isotension patented tensioning system); individual replacement or setting capability
- Main cables for suspended structures and hangers – including the new Cohestrand strand (service life in excess of 100 years) and the F-Spinning anchorage solution

### HANDLING, HEAVY LIFTING

- Using jacks, cables or the APS (Air Pad Sliding) system

### STRUCTURAL FITTINGS

- Expansion joints; bearings (elastomeric and mechanical); earthquake-proofing devices (isolators, shock absorbers, shock connectors-transmitters)

Prestressing, construction methods, cable stayed structures, structural fittings: In each of its specialties, Freyssinet sets high and specified performance criteria generally positioned above the usual industry standards. The requirement for quality applies not just to products developed in the Group's laboratories, but also to implementation, adherence to deadlines and durability. Freyssinet Group strives to respond to major challenges from clients in terms of technical and economic performance, reliability and durability.

In the Auvergne region of France, Freyssinet has installed all the prestressing in the Sioule viaduct on the A89 motorway (1,200 tonnes of steel).



At the Deep Bay viaduct construction site in Hong Kong, the Group has installed 113 spans using two in-house designed trusses.



During the summer of 2005, 70m of expansion joints were replaced on the Saint-Cloud bridge in France.



Freyssinet teams specialising in water engineering can refurbish any type of structure while adapting to height and configuration constraints.



Applying Carbon fibre fabric (TFC®) by cold bonding is an easily implemented means of strengthening structures.

## Repair and maintenance

The ageing of structures, often accelerated in the case of civil engineering works by increases in traffic load and volume, generates a growing need for refurbishment exacerbated by the increasing stringency of regulatory requirements. In an extension of its know-how in new structures, Freyssinet has developed a full range of expertise in repair, protection, strengthening and altering structures enabling refurbishment to be combined with optimisation of the structures' capabilities. The application of high-performance maintenance, diagnostic and inspection techniques contributes to enhanced durability of structures.

### STRENGTHENING

- Composite strengthening materials
- Shotcrete
- Additional prestressing

### REFURBISHMENT

- Sealing
- Protecting concrete reinforcement
- Underpinning
- Decontamination

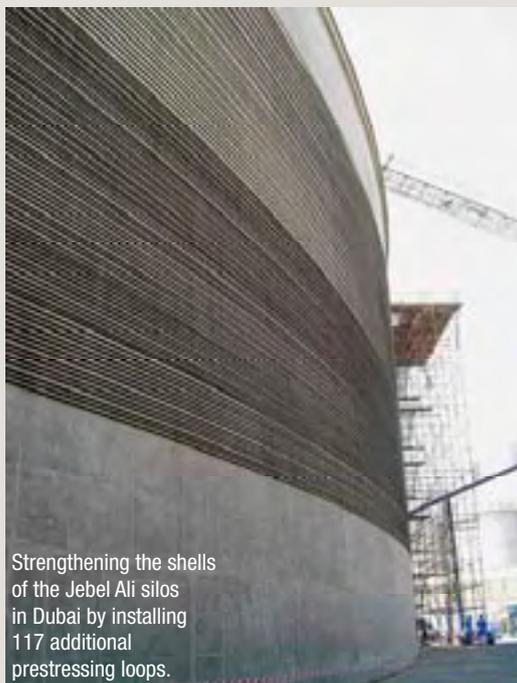
### MAINTENANCE

- Replacement of structural fittings
- Instrumentation, inspection, maintenance management

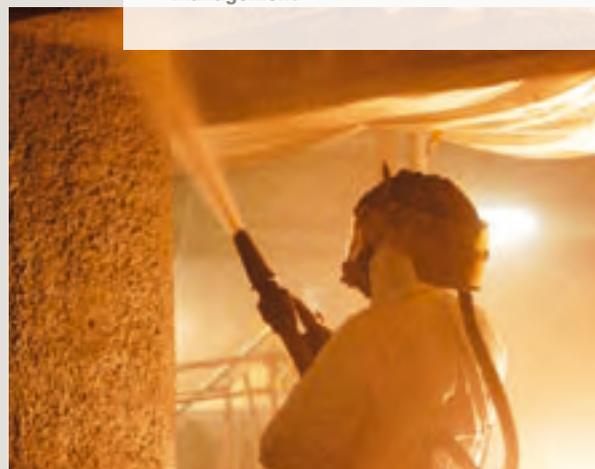


### NUCLEAR DISMANTLING

- Engineering, security
- Cleaning up, radiation protection, decontamination
- Project management



Strengthening the shells of the Jebel Ali silos in Dubai by installing 117 additional prestressing loops.



Strengthening and restoration of structures with Shotcrete.

As part of the redevelopment of the Abu Dhabi coastal road in the United Arab Emirates, Ménard Soltraitement was involved in the consolidation of almost a Million square metres of reclaimed land requiring the use of four dynamic compaction units.



# Soils

Through the Reinforced Earth and Ménard Soltraitement companies, the Freyssinet Group has developed a full range of solutions for foundations, retaining walls and soil improvement. These solutions can relate to transport infrastructure – road and motorway works, airport and seaport platforms, etc. – as well as industrial and commercial sites, especially those intended for handling very heavy loads.

Based on exclusive processes being constantly perfected, Reinforced Earth and Ménard Soltraitement solutions combine rapid installation, cost effectiveness, adaptability to difficult situations, environmental integration and reliability with precise commitments to results.



In the port of Kwang Yang in South Korea, Ménard Soltraitement took part in the two-stage development of 350,000 m<sup>2</sup> of land reclaimed from the sea by infill.

## A full range of solutions for foundations, retaining walls and soil improvement



Reinforced Earth retaining wall for a high-speed line in South Korea. Throughout the world, the speed of implementation and the architectural resources of the technique make it effective in railway, road or motorway structures.





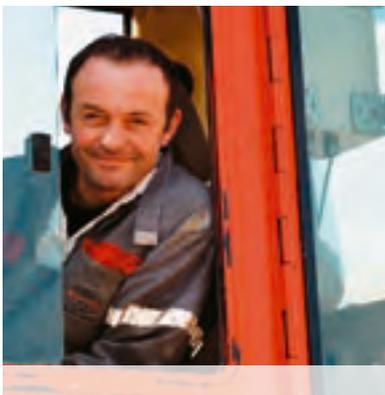
In the Australian state of Queensland, a 42,000 m<sup>2</sup> platform was treated with dynamic compaction and dynamic replacement to enable it to accommodate a sugar storage complex.



Offshore soil consolidation in San Diego in the USA by placing ballast using a vibrating drill.



Vertical drainage is used with land that has a low degree of permeability, enabling the rate of consolidation to be increased considerably.



## Foundations and soil improvement

Operating in 30 countries, for over 30 years Ménard Soltraitement has been developing innovative solutions that are an economical and reliable alternative to traditional deep foundations.

Ménard Soltraitement selects appropriate improvement techniques according to the geotechnical properties of the soil, the thicknesses of the various strata and the type of structure to be supported and – using its own equipment – implements turnkey solutions from preliminary surveys to project implementation. Complying with the most stringent requirements, these solutions have been tried and tested on numerous major projects throughout the world.

### SOIL IMPROVEMENT

- Dynamic compaction
- Vibroflotation
- Preloading by filling
- Vacuum compaction (Menard Vacuum)

### SOIL IMPROVEMENT WITH ADDITIONAL MATERIAL

- Stone columns and dynamic replacement
- Controlled modulus columns
- Jet grouting

### CONSOLIDATION OF BUILT-ON LAND

- Underpinning

### SOIL DECONTAMINATION

- Venting
- Skimming
- Neutralisation

### UNDERPINNING FOUNDATIONS

- Jet grouting
- Micropiles

### SOIL INSPECTION, SURVEYS AND DIAGNOSTICS

- Identification of geotechnical properties
- Risk assessment



Ménard Soltraitement installed 350 stone columns in the Paris region of France in order to consolidate the site of a low-rise housing area.

Ménard Soltraitement installed 9,500 controlled modulus columns on the site of the Newport bypass motorway in the United Kingdom.





Reinforced earth slip road on Interstate highway I-4 in the state of Florida in the US.

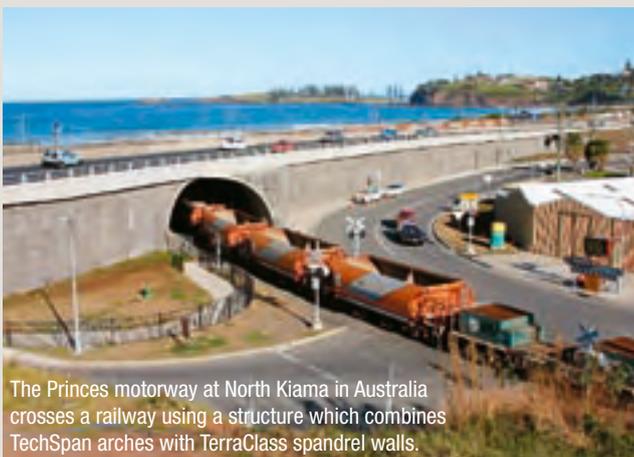
## Reinforced Earth

### Reinforced Earth

A major innovation in the field of civil engineering, Reinforced Earth is a soil strengthening technology based on combining compacted infill with metal or synthetic reinforcement strips attached to cladding units. Having been implemented on almost 40,000 projects throughout the world, Reinforced Earth solutions combine reliability (quick and easy construction), adaptability to complex situations (narrow confines, unstable slopes, substantial settlement) and creativity (variety of claddings).

### Precast arches

Designed and developed by Reinforced Earth, TechSpan arches combine natural structural arching properties and the use of backfill to build underground, hydraulic, road or railway structures. The arches combine engineering performance (span up to 20m, backfill covering in excess of 30m), with simple assembly (half-sections mounted on foundations at the bottom and abutting one another at the top).



The Princes motorway at North Kiama in Australia crosses a railway using a structure which combines TechSpan arches with TerraClass spandrel walls.

In Abu Dhabi (United Arab Emirates), Reinforced Earth has designed a 6,400m long tiered wall, rising to a maximum height of 12m (32,000 m<sup>2</sup>) as part of the construction of the Sheikh Zayed bridge.



### ROAD STRUCTURES

- Single or tiered carriageway retaining walls
- Bearing abutments
- Composite abutments
- Slip road retaining walls
- Reinforced embankments
- Noise prevention barriers
- Underpass and flyover arches
- Covered cuttings

### RAILWAY STRUCTURES

- Retaining walls for underground rail and MTR systems (including high-speed track)
- Arches for tunnels under backfill

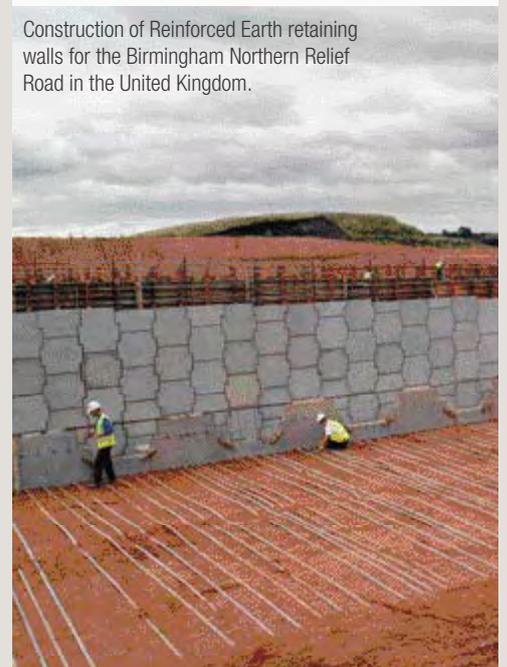
### INDUSTRIAL STRUCTURES

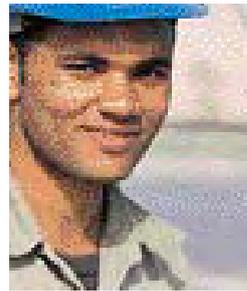
- Retaining walls
- Containment bunds
- Dump walls
- Civilian, military, industrial protective structures
- Arches for underground shelters, conveyor tunnels, etc.

### HYDRAULIC STRUCTURES

- Quay walls (marinas, fishing ports, etc.)
- Dams
- Breakwaters
- Waterway and hydraulic landscaping

Construction of Reinforced Earth retaining walls for the Birmingham Northern Relief Road in the United Kingdom.









1 bis, rue du Petit-Clamart  
78140 Vélizy-Villacoublay  
France  
Tel.: (+33) 1 46 01 84 84  
Fax: (+33) 1 46 01 85 85

[www.freyssinet.com](http://www.freyssinet.com)



**Reinforced Earth**

1 bis, rue du Petit-Clamart  
78140 Vélizy-Villacoublay  
France  
Tel.: (+33) 1 46 01 84 84  
Fax: (+33) 1 46 01 85 85

[www.terre-armee.com](http://www.terre-armee.com)



ZI de la Butte - 2, rue Gutenberg  
91620 Nozay  
France  
Tel.: (+33) 1 69 01 37 38  
Fax: (+33) 1 69 01 75 05

[www.menard-soltraitement.com](http://www.menard-soltraitement.com)