


Prestressing bars



Prestressing bars represent a simple and effective solution for securing and tying structural elements together or transferring compressive forces to generate the necessary friction between the surfaces in contact.

Specialist civil engineering

Founded over 75 years ago, **Freyssinet** brings an unrivalled set of skills to the specialist civil engineering sector. With expertise in designing elements and structures, producing materials and equipment and installing them on site, **Freyssinet** offers integrated technical solutions in two major fields, namely construction and structural repair.

- **Construction – civil engineering structures, buildings, stadium roofs, wind turbine towers, etc.:**
 - prestressing;
 - construction methods;
 - cable-stayed structures;
 - structural accessories.
- **Repair – civil engineering structures, buildings, industrial infrastructure, marine and river structures and water infrastructure:**
 - strengthening using additional prestressing, carbon fibre composites and shotcrete or sprayed UHPFRC;
 - protection against the effects of corrosion, earthquakes, fire, chemical attack, etc.;
 - maintenance of structural accessories (joints, bearings, prestressing and stay cables).



Bridges and stadiums



Buildings



Industrial structures



Energy infrastructure



Tunnels and arches



Historic monuments



Water engineering



Ports and marine structures

**Our top priority:
to ensure everyone's safety**



Our "Sustainable Technology" tagline expresses our determination to offer our customers sustainable and environmentally friendly solutions, while providing our employees with a work environment where safety, risk management and innovation are always foremost in our minds. Managing safety on our sites is therefore our primary duty towards our employees worldwide, whatever the local regulations. We are fully committed to the goal of "Zero Lost Time Injuries"; our rules, our "non-negotiables" and our in-house tools ensure that this commitment will become reality.

"Safety is the only option"



Freyssinet is a subsidiary of the **Soletanche Freyssinet Group**, the world leader in the soils, structures and nuclear sectors, which also offers a range of digital and consulting solutions for designing, building and operating infrastructures.

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West Gate Tunnel
Launching gantry
Australia



Prestressing bars

Combining design and construction expertise with unique industrial know-how, Freyssinet has been implementing its Freyssibar and Freyssibar+ prestressing bar systems for decades, fulfilling customers' every need, from the most standard cases through to the most extraordinary applications.

Freyssibar & Freyssibar+

- Several bar diameters
- Different grades of steel
- Prefabricated solutions

Services...



Consulting and design

Incorporation of systems into the project
Enhanced solutions
Structural design and studies



Implementation

Specialist teams
In-house training delivered around the world
High-performance equipment



Monitoring

Instrumentation
Inspection
Diagnostics



Maintenance

Sustainable materials
Structural rehabilitation

...to fulfil all your needs

Depending on the structure

Concrete

Steel

Masonry

Timber

For different types of prestressing

Bonded internal

Unbonded internal

External

Temporary

Permanent

For numerous functions

Restressable

Removable

Replaceable

Passive anchors

Active anchors

Example of applications

Prestressing bars represent a simple and effective solution for securing and tying down structural elements together or transferring compressive forces to generate the necessary friction between the surfaces in contact.

PRESTRESSED STRUCTURES

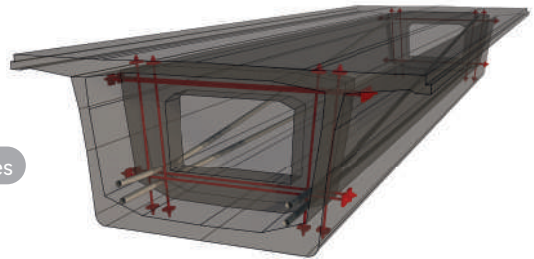
The Freyssibar and Freyssibar+ systems are widely used to create prestressed structures, especially for repairs and strengthening.

Bridges

Dams

Buildings

Civil engineering structures

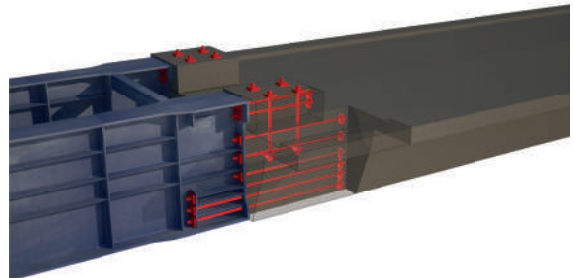


FIXING LAUNCHING NOSES

Fixing a launching nose to a deck requires the application of high prestressing forces in a confined space. Designers are often faced with the problem of how to arrange the bars in the available space. The wide range of possibilities offered by the Freyssibar and Freyssibar+ systems makes this process much easier, since they optimise the forces applied to each assembly while reducing the number of bars.

Incrementally launched bridges

De-launching



MOVING HEAVY LOADS

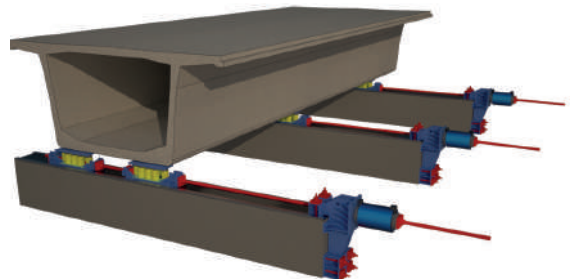
The Freyssibar system and its accessories are easy to use and deliver superior strength and reliability, meaning that they are ideally suited to moving heavy loads. This system transfers the force that is required to move the structure using extremely light equipment.

Sliding

Pushing

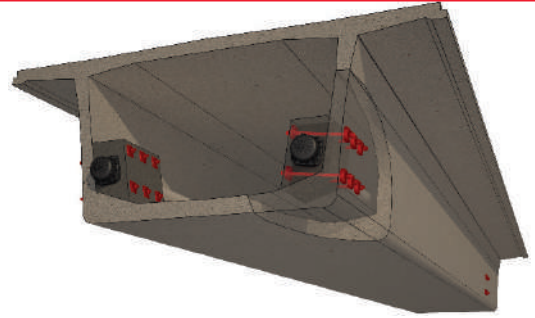
Hoisting

Driving



BLISTERS

When fitting additional prestressing tendons to existing structures, attachments (sheaves) and deviation points need to be created. The sheaves are then used to position the anchors at the ends of the tendons, while the main runs are guided through the deviation points. In this case, Freyssibar prestressing bars are used to fix the sheaves to the existing structure that needs strengthening by generating a transverse nailing force that creates the necessary friction between each sheaf and the structure.

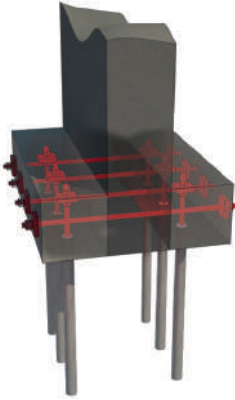


Bridge decks

Slabs

Beams

CONNECTION WITH A FOUNDATION

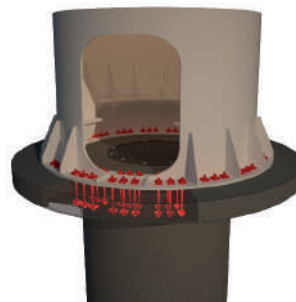


Micropiles and prestressing bars can be combined to create a simple and effective foundation for an existing or prefabricated structure. The prestressing bars create a friction joint between the structure and the sole plate, which is built on micropiles, without any need for a complex and dense rebar arrangement.

Bridge piers

Columns

ANCHORING STRUCTURAL ELEMENTS



To create a stable and long-lasting joint between two structural elements, such as steel and concrete components, they can simply be tightened together with prestressing. The Freyssibar system ensures a long-term compression joint.

Wind turbines

Towers

Antennas

ASSEMBLING PRECAST ELEMENTS

Whether for temporary or permanent applications, the Freyssibar system offers a simple and effective solution for assembling precast concrete elements with prestressing bars.

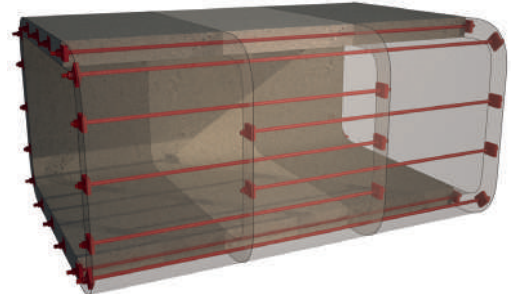
Floating caissons

3D-printed buildings

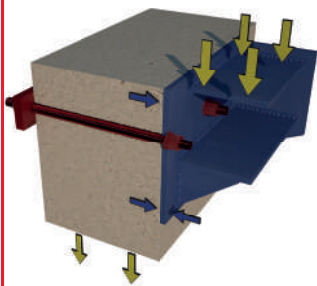
Silos

Viaducts built using launching gantries

Bridge piers



FIXING BRACKETS



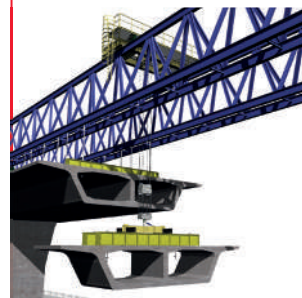
The principle of transferring the load from a bracket to a structure through friction can be achieved with the Freyssibar or Freyssibar+ system. During this process, controlling the applied forces is essential for the joint's performance and safety of the structure.

Jacking structures

Balconies

Widening pier caps or decks

CARRIAGE FORM TRAVELLERS AND LAUNCHING GANTRIES



When it comes to temporarily fixing a carriage form traveller or launching gantry, a quick, easy and reliable solution is needed that can be used over and over again. The Freyssibar system ticks all the boxes, which explains why it has entered widespread use.

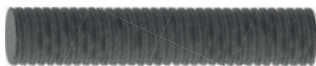
Construction of bridge decks

Freyssibar and Freyssibar+ reinforcements

Freyssinet has developed the Freyssibar range to meet most standard needs, while the specifications of the Freyssibar+ range open up the realm of applications even further.



FREYSSIBAR



During production, these bars are hot-rolled from high-strength alloy steel. They are cold worked by stretching and threaded over their entire length by cold rolling. The standard range includes nominal diameters of 26.5, 32, 36, 40 and 50 mm.



The manufacturing process produces a high-quality thread delivering greater fatigue resistance and low susceptibility to stress corrosion. The fabrication method also means that every bar is stress-tested to 85% of its guaranteed ultimate tensile strength.



The geometric shape of the thread is specifically designed for quick, accurate and easy assembly on site. Bars are available in maximum lengths of 11.8 m. For longer lengths, bars can be connected together using extension sleeves.

FREYSSIBAR+



Freyssibar+ prestressing bars are produced using a specific heat treatment manufacturing process that delivers enhanced mechanical performance. They combine the mechanical strength of a prestressing bar with a high degree of ductility.



Freyssibar+ prestressing bars generally feature threaded ends. They are especially suited to prestressing, strapping and lifting operations.



These bars are the ideal solution for structures subject to seismic forces and in areas prone to extremely low temperatures.

Bars with specific resilience specifications can be produced according to requirements.

Diameters and grades of steel other than those presented in the table below can be designed on request.



Kherrata Gorge
 Anchoring the beams to the foundation blocks
 Algeria

		MATERIAL				REINFORCEMENT						
		Ultimate tensile strength	Elastic limit	Elongation at maximum force (Agt)	Elongation at break (A%)	Young elasticity modulus	Nominal diameter (D)	Outer thread diameter (φ)	Unthreaded section diameter (d)	Mass per 1m	Ultimate strength	Elastic limit
		MPa	MPa	%	%	MPa	mm	mm	mm	kg	kN	kN
Freysisbar	1,030	835	3.5	6	170,000	26.5	30	-	4.56	568	461	
						32	36	-	6.66	828	672	
						36	40	-	8.45	1,048	850	
						40	45	-	10.41	1,295	1,049	
						50	55	-	16.02	2,022	1,640	
Freysisbar +	1,080	930	6	10	200,000	55	60	57	20.03	2,551	2,197	
						62	68	65	26.05	3,300	2,841	
						72	78	75	34.68	4,443	3,826	
						82*	88	85	44.54	5,755*	4,956*	
						92*	98	95	55.63	7,237*	6,232*	
						97*	103	100	61.65	8,042*	6,925*	

* To be confirmed through testing

Anchoring and coupling systems

Anchors

FLAT ANCHORS

These anchors are comprised of a straight nut, washer and anchor plate. They are used in most cases. When injecting the bar duct, a groove in the anchor plate allows the injection product to circulate between the duct and the cap.



TYPE 1 SPHERICAL ANCHOR

This anchor comprises a nut with a spherical seat. The nut is supported in a tapered hole machined into the anchor plate. This design compensates for perpendicular alignment issues up to 3° between the bar axis and the bearing surface when used on existing structures. It is available for Freyssibar bars in diameters from 26.5 to 50.



TYPE 2 SPHERICAL ANCHOR

This anchor comprises a nut with a spherical seat that fits into a washer machined with the same geometric shape, which is supported on the anchor plate. This design compensates for certain perpendicular alignment issues between the bar axis and the bearing surface when used on existing structures. When injecting the bar duct, a groove in the anchor plate allows the injection product to circulate between the duct and the cap.



Couplers

MOBILE COUPLER

Mobile couplers are used to connect two bars together on their main run. The duct is adapted by the coupler to provide unhindered movement during tensioning.



FIXED COUPLER

A fixed coupler is used to extend a prestressing unit already under tension by screwing a coupler to the end of a bar protruding from the anchor. In this case, the coupler barely moves during tensioning. A special cap is used to ensure a continuous duct.





Hammersmith Flyover

Fixing prefabricated sheaves
for additional prestressing
United Kingdom



Protection solutions

Freyssinet guides its customers through the best-fit anti-corrosion solutions, ensuring the durability of Freyssibar and Freyssibar+ systems.

BY CEMENT GROUT INJECTION

The alkaline nature of the grout renders the steel into a passive state, forming a protective layer against corrosion. This is the most widespread form of protection for prestressing applications.

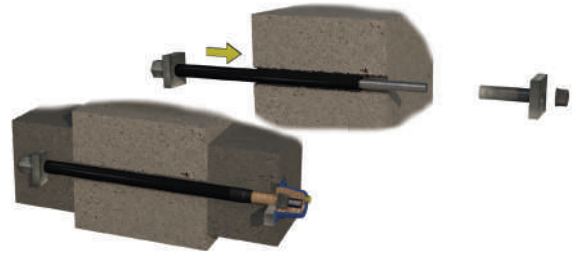
Injecting cement grout after tensioning the bars produces **bonded prestressing**.



BY WAX INJECTION

Petroleum wax is injected into the prestressing duct to protect the bar against corrosion. The wax can be injected on site after tensioning or during prefabrication in the factory.

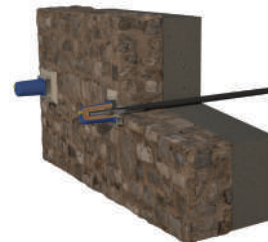
This solution produces **unbonded prestressing**, so that the residual prestressing force can be checked over time. The bar can be re-tensioned or replaced if necessary.



BY HEAT-SHRINK SLEEVE DURING PREFABRICATION

A heat-shrink sleeve whose an internal surface is coated with anticorrosion mastic is hot-fitted to the bar requiring protection.

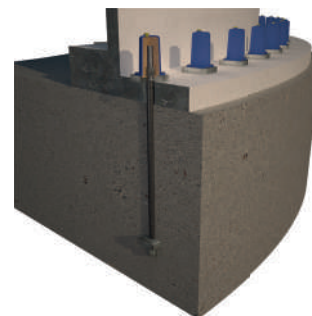
This type of protection can be used for **external prestressing** elements. Its **extremely compact design** means that bars can be passed through smaller holes (such as through a metal plate or core).



BY WAX TAPE DURING PREFABRICATION

The bar is covered with tape impregnated with petroleum-based anticorrosion mastic. The tape is also covered with a polyethylene strip.

The protected bar is positioned directly in the rebar arrangement and equipped with its embedded anchor, for **unbonded prestressing** applications. It is often used to anchor a metal structure to a solid concrete foundation (metal shaft, bracket, etc.). Its **compact design** allows for easier fitting into a dense rebar arrangement.



Other types of protection can be designed on request.

Implementation

Qualified teams

Freyssibar and Freyssibar+ systems can only be installed under the guidance of a specialised technician to ensure the highest quality and safety.

For many years, Freyssinet has been offering a training and qualification programme for technicians and engineers working on prestressing projects.

Dedicated training sites and regular mentoring for graduates guarantee high-level skills and expertise.



Freyssinet equipment

Freyssinet has created a dedicated entity for maintaining and servicing the company's installation equipment (jacks, hydraulic pumps, mixers, etc.). The equipment provided on site is always compliant with standards and calibrated according to the applicable regulations.





Office of the Future
Prestressed assembly of 3D-printed elements
Dubai



Tailored solutions

From simple technical support to the provision of end-to-end services, Freyssinet tailors its solutions to customers' specific needs:

- ✔ The installation of very short bars, requiring a suitable tensioning protocol and an increased ability to withstand the forces involved.
- ✔ The short lead-times that may be required between tensioning and providing permanent corrosion protection. It is vitally important to have detailed insights into the behaviour of the systems used and how to ensure effective protection during this period.
- ✔ Changes to the design during installation, which Freyssinet's employees can accommodate by instantly drawing on their in-depth knowledge.



End-to-end expertise

✓ Design

We offer all our customers around the world the same level of excellence in the quality of our products and services by incorporating our industrial expertise during the design stage. This **complete control over our products and systems** means that we can tailor our solutions to a wide range of applications and extreme operating conditions.

Freyssinet has an in-house **design office** capable of designing all types of prestressing systems.

Coordination between the design, manufacturing solutions and choice of materials is essential to optimise our solutions and provide **reliable and durable products**.

✓ Industrial expertise

Based in France, our **industrial division** acts as a focal point for all of Freyssinet's expertise in materials, manufacturing, production, inspection and logistics. It coordinates all the production sites worldwide.

A large contingent of **quality control experts and specialists in production processes**, including smelting, plastic injection moulding and mechanical engineering, travels the length and breadth of the five continents in order to guarantee the same level of quality in our manufactured products, irrespective of the production sites.

✓ Testing

Freyssinet has an **in-house test centre** featuring specialist equipment for carrying out testing on most products during both the product development and approval phases.

✓ Quality assurance

The network of production sites requires daily involvement from the quality control department, which guarantees the conformity of the products supplied. **All products are checked and inspected** using cutting-edge measuring instruments.

All checkpoints are defined internally, and a certificate of conformity is issued for each product supplied.

Products are checked for conformity with the various applicable standards. The Freyssibar and Freyssibar+ systems have received the European Technical Assessment and CE marking, as well as RMS certification in Australia.



Portfolio

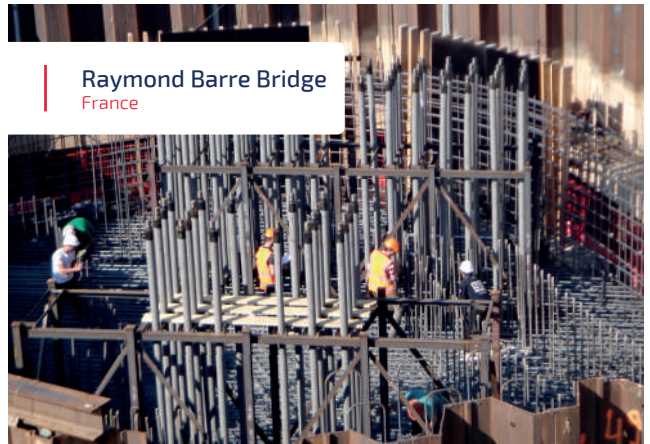
Motorway interchange,
Tuen Mun-Chek Lap Kok
Hong Kong



Freyssinet dynamic test
laboratory, Isolab
Italy



Raymond Barre Bridge
France



RER Station,
CNIT Paris La Défense
France



Orly Airport, bridge 2
France



Arch bridge,
Ischigualasto
Argentina



Tangier-Kenitra high-speed
railway line, Lahlou viaduct
Morocco









FREYSSINET

Freyssinet, the world leader in specialist civil engineering, offers sustainable, effective, tailored solutions based on vertical integration from engineering and manufacturing to implementation.

www.freyssinet.com



SUSTAINABLE TECHNOLOGY