



Terratest

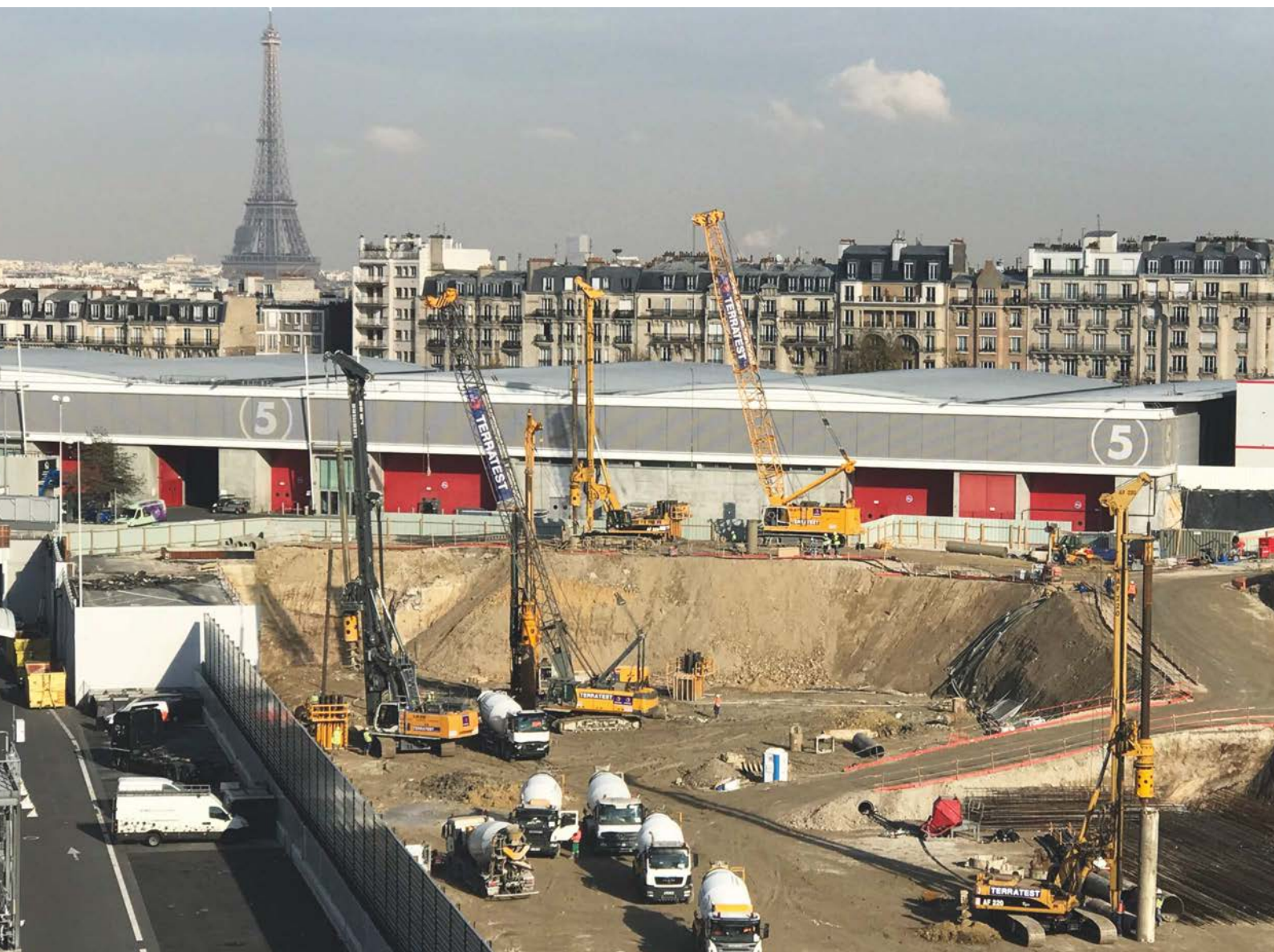
Bored Piles



TERRATEST

C O N T E N T S

- 1 Concept
- 2 Characteristics
- 3 Procedure
- 4 Description of methods. Applications
- 5 Pile slurry wall
- 6 Material specifications
- 7 Parameter controls and load and Integrity tests
- 8 Other work units



1 CONCEPT

Extraction piles, bore-cast and concreted «in situ», constitute one of the classic foundation systems for problems arising from the land's support capacity or from the need to carry heavy loads transmitted by the structure to which the foundations are destined.

The constant development of new equipment and tools make it possible to obtain greater performance (yields, depths, embedding, diameters, etc.) in better time, all accompanied by a simultaneous increase in quality and safety in the work.

Terratest Cimentaciones, S.L. responds to its customers' needs with comprehensive foundation systems, not restricted just to the piling work. The company designs and develops technical solutions appropriate to each foundation problem, always seeking to match reduced cost with the shortest possible deadlines.



Steel Piles Trans Gambia Bridge (The Gambia)

2 CHARACTERISTICS

There is an on-going drive by TERRATEST CIMENTACIONES, S.L. in R+D+i (Research, Development and innovation) to offer the latest advances in this type of piling.

The company also has its own safety and quality departments, at all times monitoring the infallible progress of its work, with the priority objective of zero work accidents.

It has since 2003 been certified as a registered company for foundation work using piling bored according to the demands of Spanish Standard UNE-EN ISO 9001: 2000.

Piling bored and concreted «in situ», normally able to absorb combinations of vertical and horizontal stresses and bending moment (e.g. in bridge structures), can bear bending stresses as in land contention using in-line piles (pile slurry walls).

It can be employed on virtually all types of land, with the right boring tools.

Placement is in isolation or in groups in different arrangements.

Diameter varies between 450 and 2,200 mm, depending on the bore type, to maximum depths of some 60 m. Consideration can be given, on order, to the provision of machinery making it possible to increase those diameters and depths.



Quay Extension, Tulcea Port, Phase 4+5, Romania

3 PROCEDURE

There are basically three phases in the procedure for a pile bored and concreted «in situ»:

- a) The bore
- b) Installation of reinforcement
- c) Concreting

The characteristics of the land (stratigraphy, water level, etc.) condition the bore type and system: dry rotation, rotation with recoverable casing, rotation with muds and, finally, with and recoverable casing chisel & grab.

The choice of method is determined fundamentally by the land to be bored, and operational economies, also taking account of further factors such as the surroundings. TERRATEST CIMENTACIONES, S.L. has the construction systems required to minimise interference in the area, and show the greatest respect for the environment and its conservation.



La Carolina Station, Metro Quito, Ecuador

4 DESCRIPTION OF METHODS. APPLICATIONS

Dry rotation

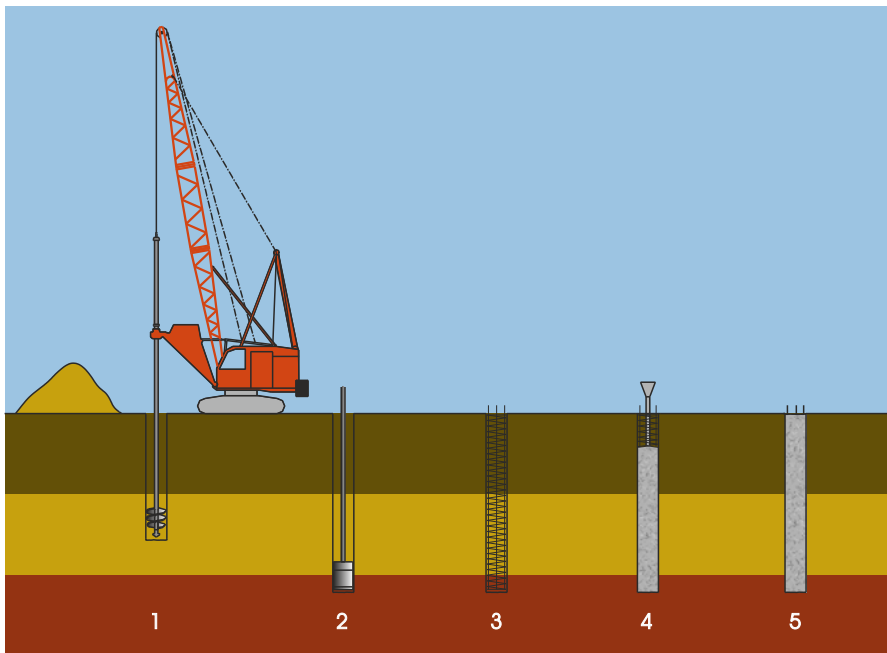
Applications

Stable soils

Characteristics

Vibration-free boring

Usual diameters: 450-2700 mm



1. Perforation with auger in stable soil.
2. If necessary, bottom cleaning using a bucket.
3. Installation of reinforcement.
4. Concreting with tremie tube.
5. Pile finished.



4 DESCRIPTION OF METHODS. APPLICATIONS

Rotation with muds

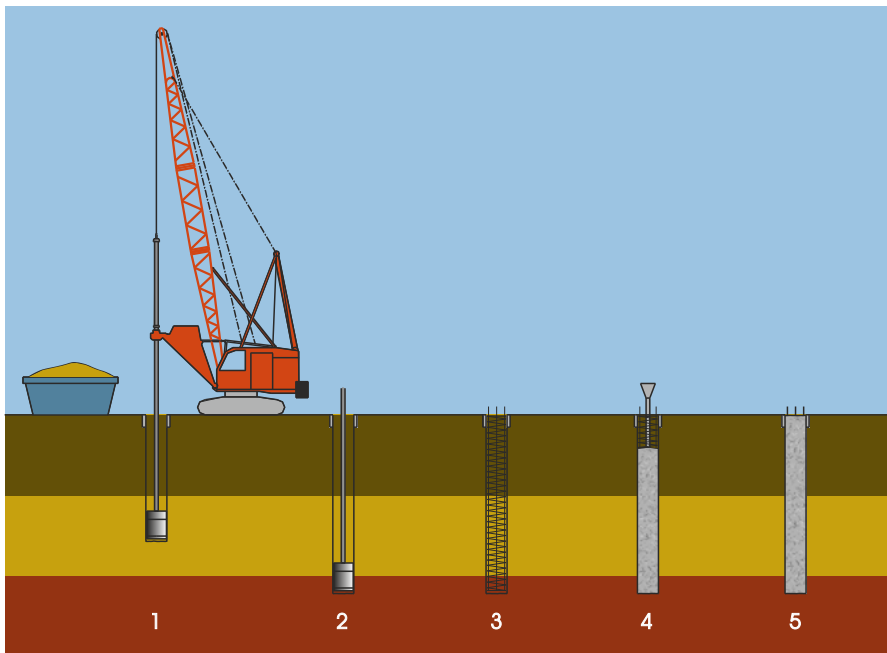
Applications

On any soil which can be stabilised with bentonite mud

Characteristics

Vibration-free boring

Usual diameters: 650-2500 mm



1. Perforation with angler or bucket, stabilizing the drilling with mud.
2. Bottom cleaning with bucket or Air lift and, if applicable, change of contaminated mud.
3. Installation of the reinforcement.
4. Concreting with tremie tube, and mud recovery (de-sanding).
5. Pile finished.



4 DESCRIPTION OF METHODS. APPLICATIONS

Rotation with recoverable steel casing

Applications

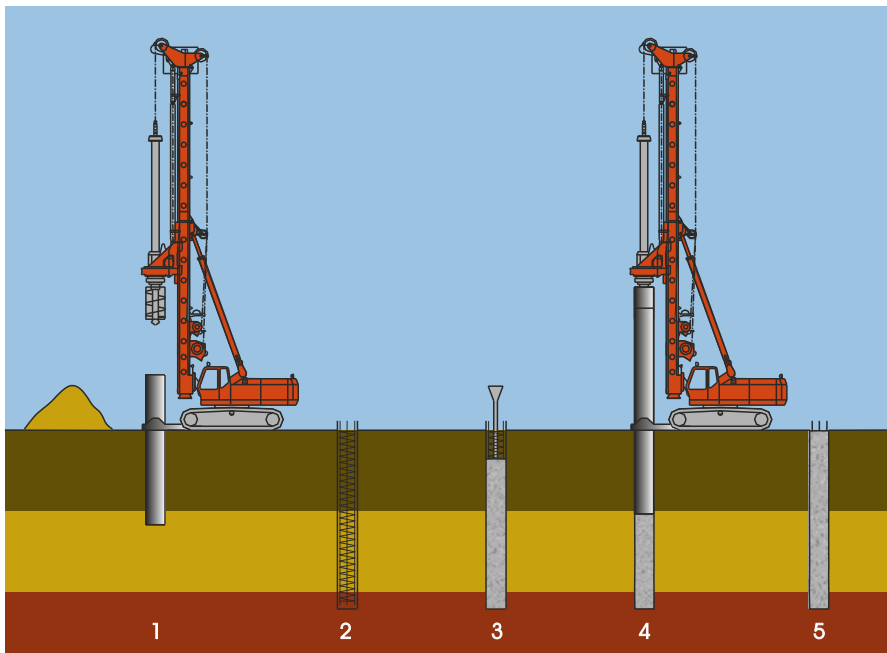
All soil types (except great boulders)

Characteristics

Vibration-free boring.

Minimum concrete consumption.

Most usual diameters: 650-2000mm



1. Excavation using auger or bucket, retaining the tunnelled walls using recoverable casing.
2. Fitting the reinforcing.
3. Concreting with tremie tube.
4. Simultaneous extraction of the casing.
5. Complete pile.



4 DESCRIPTION OF METHODS. APPLICATIONS

Piles using scoop and recoverable casing

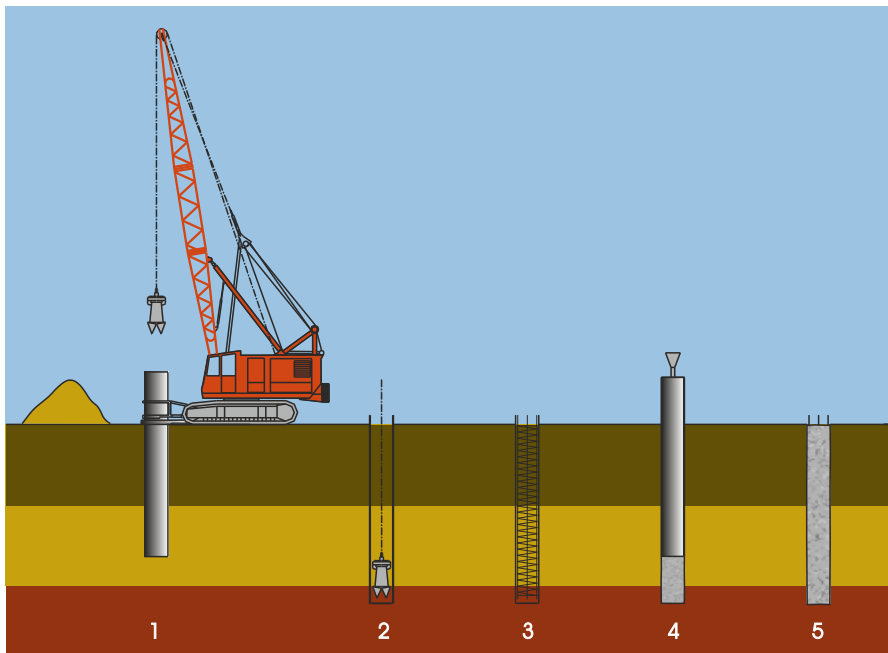
Applications

All types of soil, including large stones or boulders and totally heterogeneous landfills (ports, waste dumps, etc.)

Characteristics

Possibility of long lengths

Usual bore sizes: 1250-2000mm



1. Excavation using a grab and chisel, retaining the tunnelled walls using recoverable casing.
2. Fitting the reinforcing.
3. Concreting the pile using tremie tube.
4. Simultaneous extraction of the casing.
5. Complete pile.



5 PILE WALLS

Piles are also used to protect digging in the supporting of soil.

Depending on the characteristics of the soil to be retained, they are set apart at a tangent and even secant piles.

These are clearly advantageous in comparison with diaphragm walls where there is no water table: saving of money and time, drilling without using bentonite, drainage permitted without creating the screen effect, easier to dig through very hard layers, no vibration and adaptation to existing services, etc.



1. Retaining using a pile wall for the El Corte Inglés Shopping Centre in Pamplona (Navarra)

2. M-30 Pío XII and Avenida Burgos connection (Madrid)

5 PILES WITH PERMANENT CASING

The soil sometimes requires the fitting of permanent metal casing around the pile that can also be used as auxiliary casing during drilling or can be fitted with the reinforcement once the pile has been inserted.

The permanent metal casing is often necessary in very permeable soil with water circulation or in very aggressive soil for concrete or in soil with cavities (karstic formations, collectors, etc.) and must be used in liquid mediums (such as ports or pontoons) as permanent shuttering underneath the draught.

The characteristics of this casing (thickness, section length, etc.) shall be defined according to the work to be undertaken and the environmental conditions.



Danube River Bridge Vidin (Bulgaria) Calafat (Romania)

6 CHARACTERISTICS OF THE MATERIALS

The construction materials used for the piles must meet the specifications given in the Specific Project Provisions.

They must also be in line with the recommendations offered in the Geotechnical Report, a necessary document to define the geo-resistant parameters of the soil and to choose the most suitable pile.

The instructions given in the EHE Regulation: Instructions for the Design and Implementation of structural Concrete Work, PG3: Terms and Conditions for General Technical Provisions regarding Public Works and CPI 1977: Bored Pile Technological Regulation and Technical Building Code will be taken into account.

The piles must be reinforced along their entire length, the reinforcement being calculated to cover the stress to be absorbed. The reinforcement must be appropriately stiffened for hoisting and fitting on the pile. Mild steel hoisting handles will be fitted.

The piles will be concreted upwards using tremie tube. The concrete will have a slump in the Abrams cone of between 16 and 20 cm and a characteristic resistance established according to the project.



Overlapping and fitting of pile reinforcement



Concreting piles using tremie tube

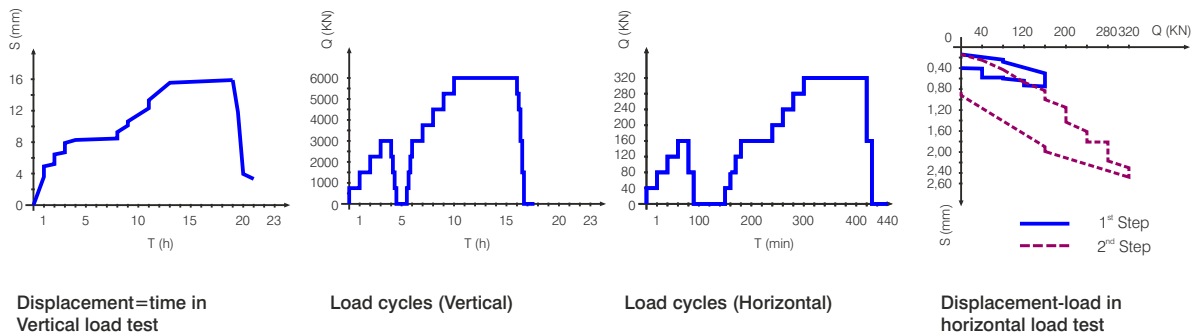
7 PARAMETER CONTROL AND LOAD AND INTEGRITY TESTING

Durante la perforación de todos los pilotes se lleva un control de los parámetros tanto del terreno como de los materiales constituyentes, que garantiza una correcta ejecución y acabado del pilote que garantiza la misión estructural encomendada.

La capacidad de un pilote puede ser determinada con pruebas estáticas de carga en las que Terratest cuenta con una dilatada experiencia en la preparación, elaboración y obtención de resultados que permiten definir claramente la capacidad de carga del pilote en el terreno donde se ha de desarrollar la obra y la posible optimización en función de los resultados obtenidos.

Asimismo, Terratest realiza ensayos de integridad en pilotes tales como los de Impedancia Mecánica y Sónicos.

Los ensayos de Impedancia Mecánica y Sónicos permiten, de forma rápida y no destructiva, determinar, entre otras, la posible existencia de discontinuidades a lo largo del pilote (cortes de hormigón, baja calidad del mismo, etc.).



Test graphs

Pile load test

8 OTHER WORK UNITS

In order to continue offering overall foundations solutions to its customers, TERRATEST CIMENTACIONES, S.L. develops studies and implements work that go beyond merely boring piles, i.e.:

- Supply of concrete
- Supply of reinforcements
- Earth movements prior to and during pile boring
- Pile topping using hydraulic equipment for high output
- Pile capping, etc.



Pile topper

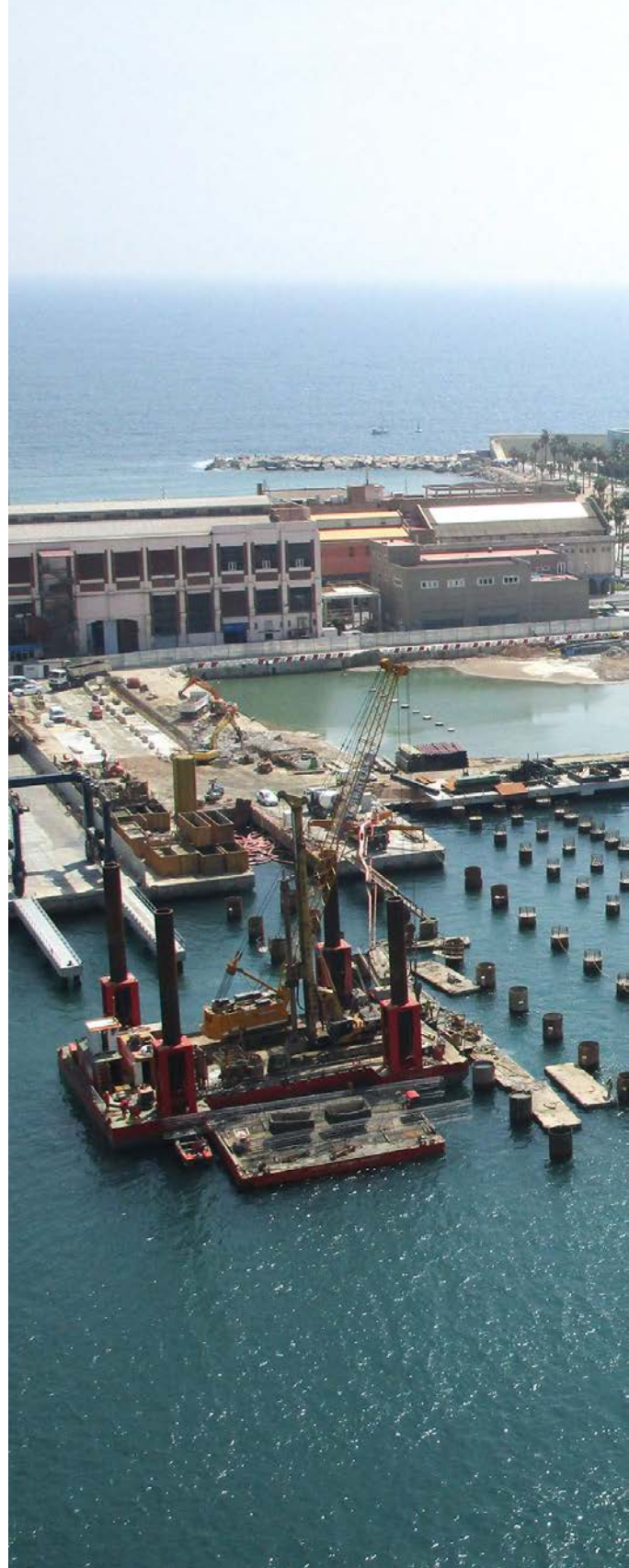


Madrid-Barcelona-France Border High Speed Railway, Spain



TERRATEST

Juan de Arespacochaga y Felipe, 12
E28037 Madrid
Tel.: +34 914 237 5 00
Fax: +34 914 237 5 01
E. Mail: terratest@terratest.com
www.terratest.com



Member:

