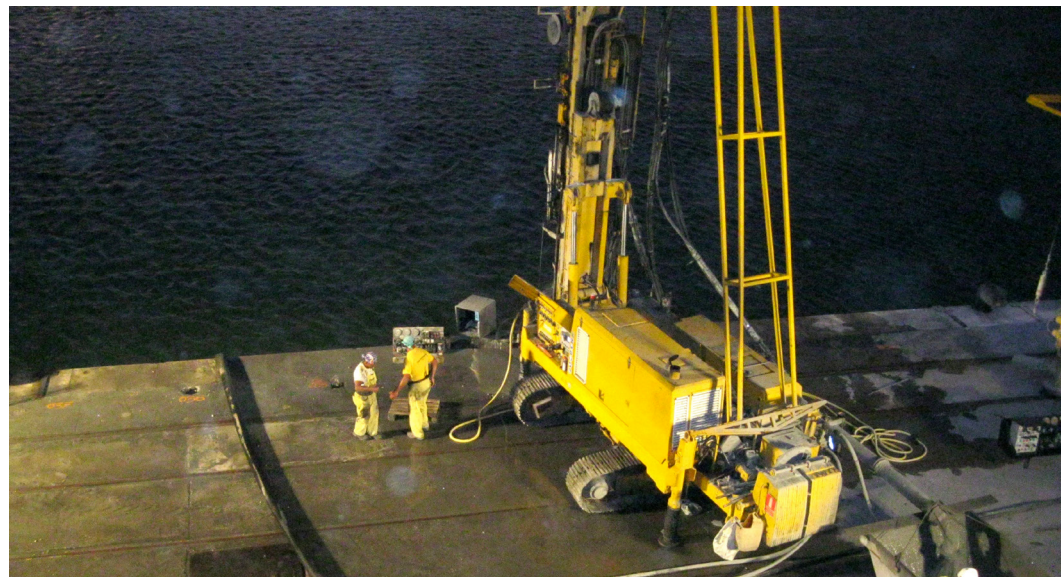




TARRAGONA PORT (SPAGNA)

TARRAGONA PORT (SPAIN)

PROJECT:

Consolidation of the sub-foundations of the "Aragon Wharf" at the industrial port of Tarragona (Spain) to ensure additional mooring for deeper draft mercantile shipping.

EXECUTION PERIOD:

April 2010 – December 2010

CLIENT:

FCC CONSTRUCCION S.A. ESPAÑA per AUTORIDAD PORTUARIA DE BARCELONA

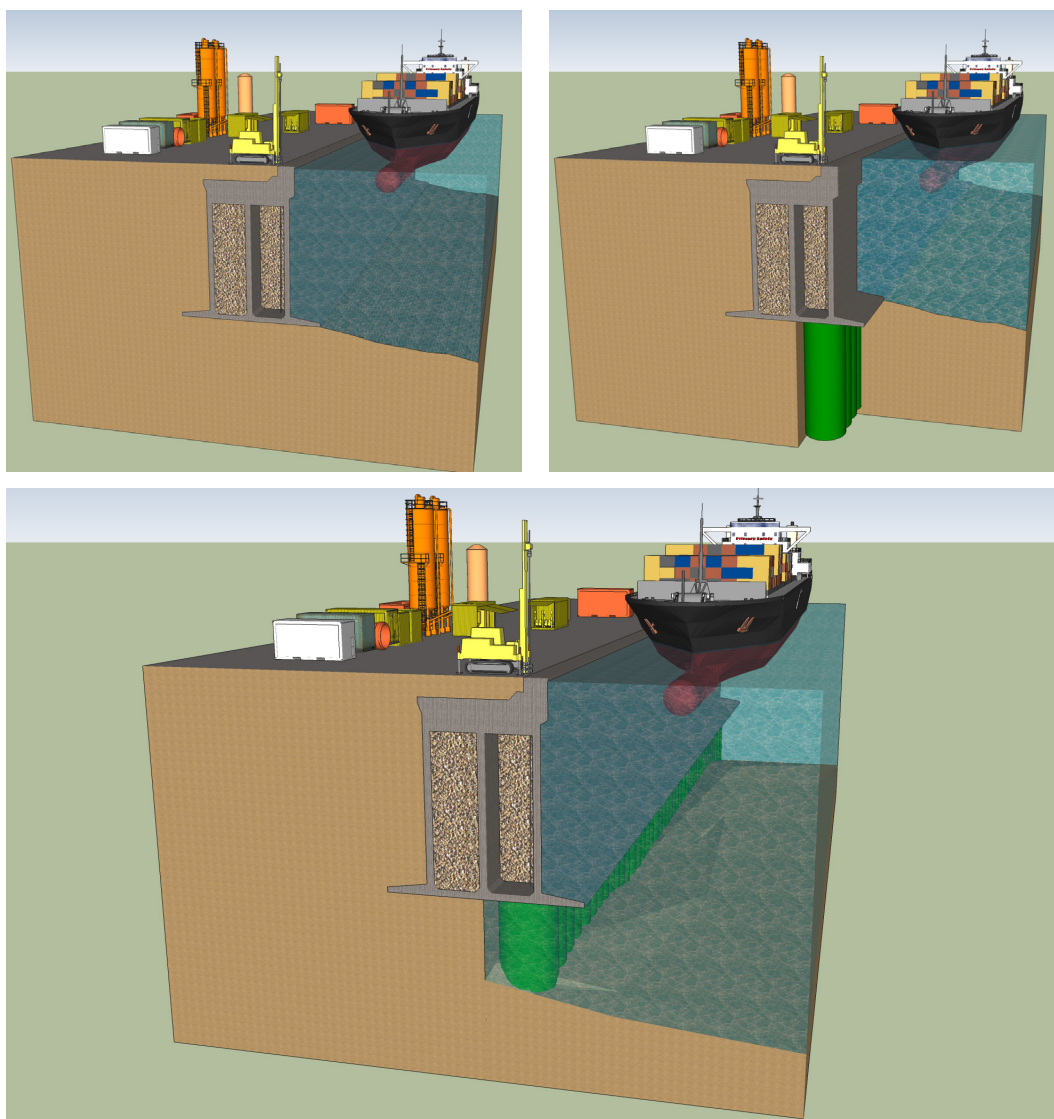


Fig. 1. 3D sketches of intervention

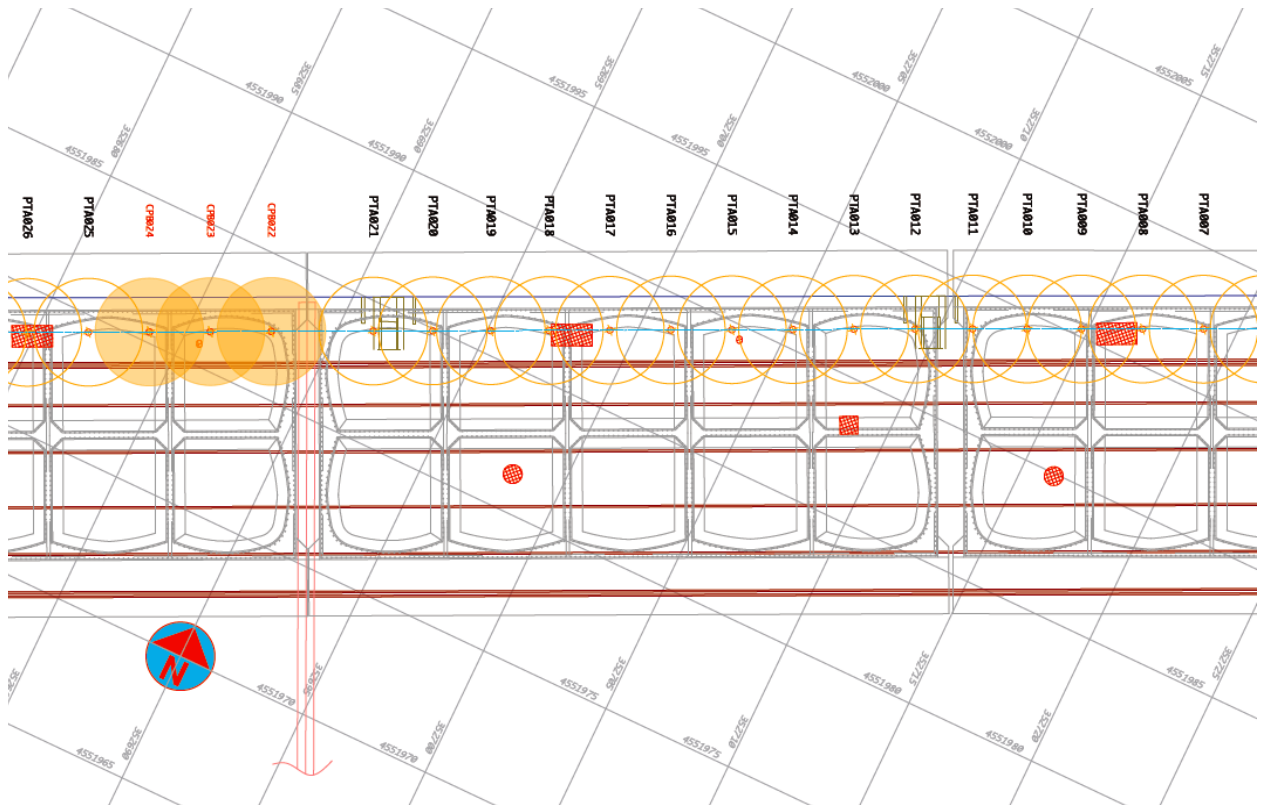


Fig. 2. Plan view of layout

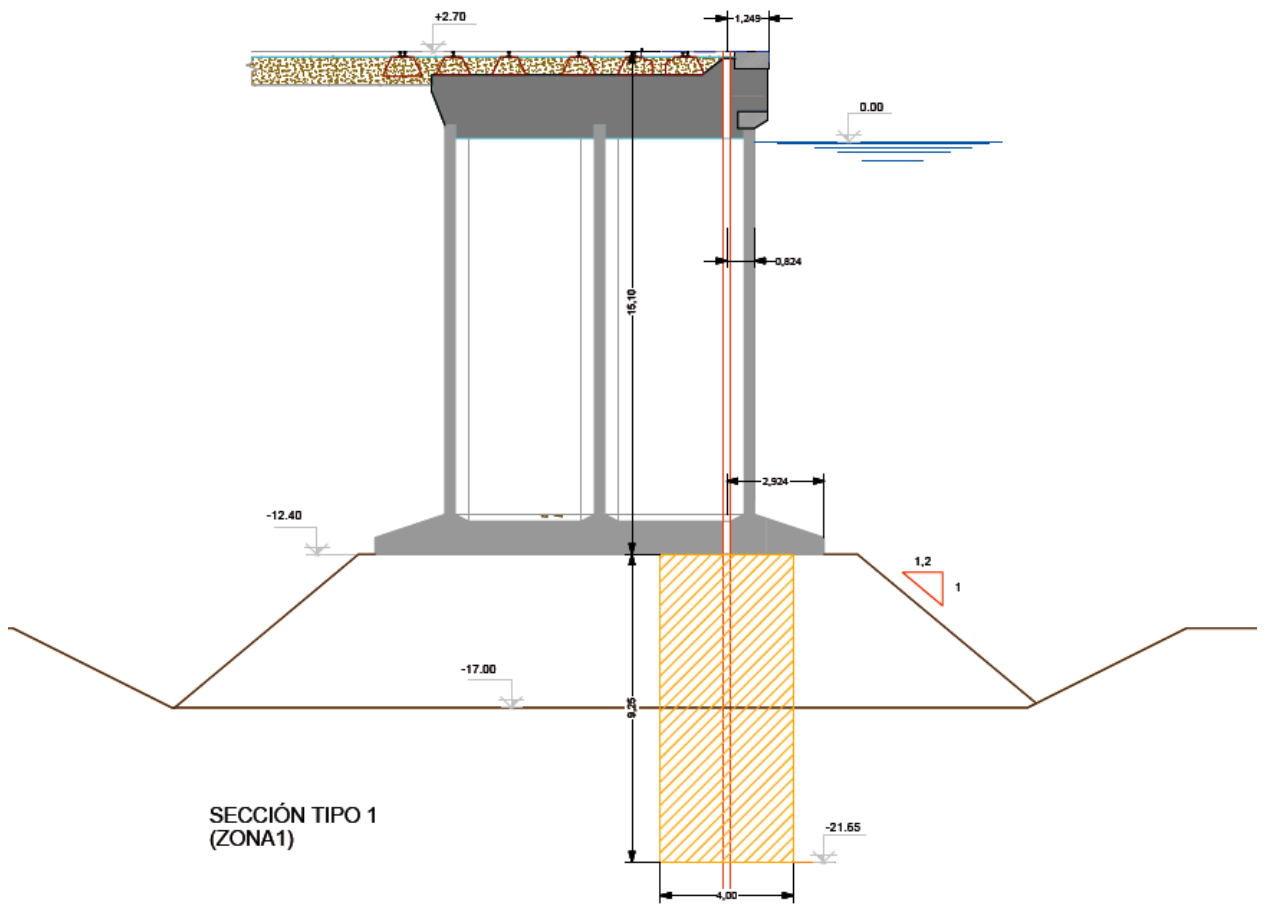


Fig. 3. Typical cross section

Introduction

The commercial port of Tarragona stands as the most important in Spain in the traffic of bulk agricultural products and is one of the most important for transporting petroleum products for the petrochemical industry. It is currently undergoing a massive investment plan for the expansion and improvement of port terminals to provide a better service for freight traffic.

Scope of works and solutions adopted.

The Port Authority of Tarragona, in the context of the overall project, aimed to increase the capacity of the Aragon wharf by dredging the bottom to allow the berthing of large mercantile vessels.

To accomplish this, consolidation of the foundations of the substructure of the quay was envisaged using pre-cast concrete caissons; stratigraphic sequence of the quay was as follows:



Fig. 4. General view of fixed installations

- Pre-cast concrete caissons filled with coarse material such as gravel and sand from surface level to –15.00 metres.
- Caisson support foundation formed of mixed calcareous rocks with gravel and sand matrix from -15.00 to -19.50 metres.
- Seabed consisting of fine to medium sands with high level of coarse gravel from -19.50 to -24.00 metres.

Description of Interventions

The treatment was carried out with a row of “**MEGA JET**” grouting columns using **PACCHIOSI SISTEM 3 (PS3)** technology.



Fig. 5. Phase of drilling through the caissons with DTH hammer

The columns were of 4.00 m. diameter with 2.25 m. inter-axis and developed throughout the length of the Aragon wharf into a total of 456 columns.

For a more rapid and safer execution of the columns, the bore holes were first drilled using a DTH $\varnothing 220$ hammer drill; the aim was to cross the caisson concrete structure thereby optimizing both the times required for the injection drill as well as regulating the surface drainage of the injection waste water.

The execution of the columns was systematically monitored and recorded using the **PACCHIOSI RECORDING SISTEM PRS3** data acquisition system offering graphic display of the data collected.

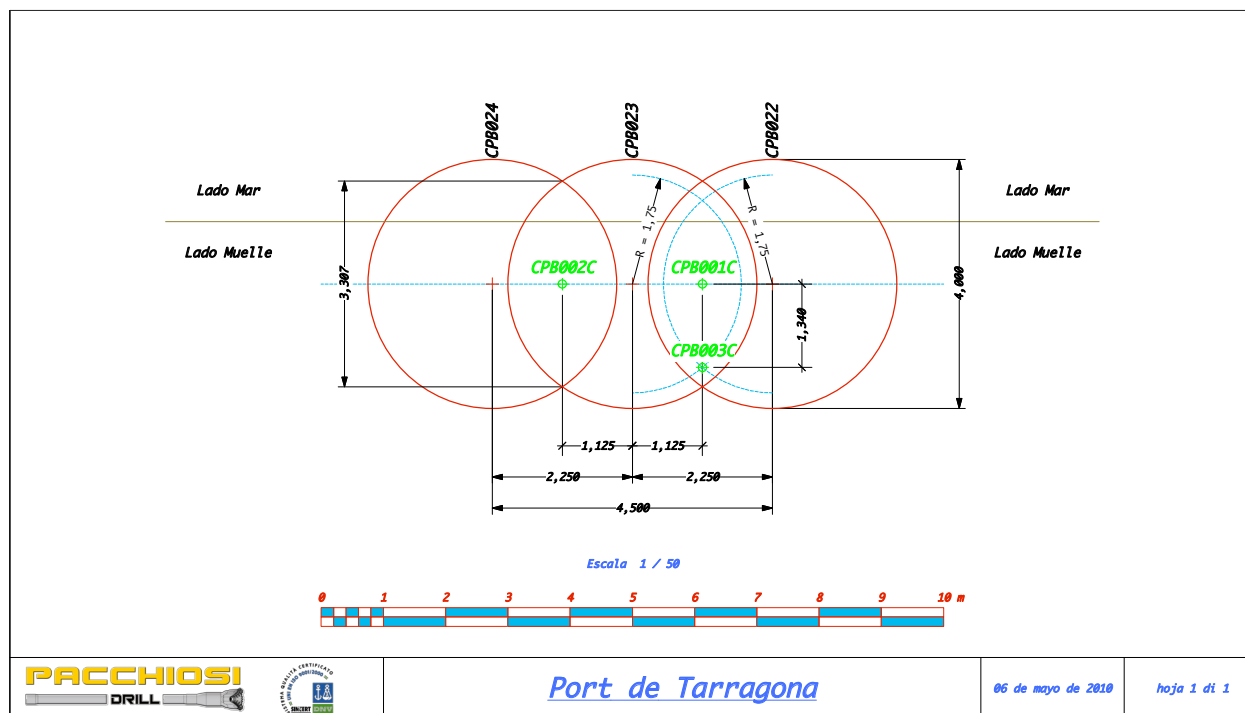


Fig. 6. Plan view of test field

Controls and Inspections

Prior to the execution of the columns, a testing field was built within the work area by executing three columns matching the 2.25 m. inter-axis of the project; once cured, three core samplings were carried out (fig. 5) which demonstrated the excellent quality of the treatment in such difficult terrain.

"Cross-hole" tests were also carried out which showed notable cohesion qualities and continuity of treatment.

Once cured, three core samplings were performed (fig. 5) which demonstrated the excellent quality of treatment in such difficult terrain.

"Cross-hole" tests were also carried out which showed notable cohesion qualities and continuity of treatment.



Fig. 7 e 8. Photographs of cored samples

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Drill Pac S.r.l. – Società soggetta a direzione e coordinamento di Ghella S.p.A
Sede Legale: Via Pietro Borsieri, 2/a - 00195 Roma (RM)
Tel. +39 06 45603.1 – Fax +39 06 45603040 – e-mail: info@drillpac.com
Sede Operativa: Frazione Borgonovo, 22 – 43018 Sissa Trecasali (PR)
Tel. +39 0521 379003 – Fax +39 0521 879922 - Sito web: www.drillpac.com