

# DRILL PAC



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

**PACCHIOSI**  
DRILL

ROCK - SOIL TECHNOLOGY AND EQUIPMENTS

CONSOLIDATIONS



SANTA MARGARIDA (BARCELONA - SPAIN)

## SANTA MARGARIDA (BARCELONA - SPAIN)

### PROJECT:

Consolidation of foundation soil of the Barcelona – Tarragona section of High-Speed railway.

### PERIOD OF EXECUTION:

June - August 2003

### CLIENT:

GIF - Impresa COMSA



Fig. 1. Pictures of worksite.





## Purpose of the work, difficulties encountered and solutions applied.

The new high-speed rail line (L/AV) in the section between Barcelona and Tarragona was constructed, near a creek, on soil with poor geotechnical characteristics with a high water content, mainly due to two reasons:

- vicinity of a river;
- high elevation of groundwater table.

To guarantee the stability of the railroad bed, it was necessary to consolidate the soil with vertical Jet Grouting treatments headed 0.50 m in the most solid layer which was encountered on the average from 5.00 to 9.00 m below ground level.

The works of consolidation were carried out while maintaining the normal railway traffic.



Fig. 2. Core samples from the area of interest, showing the two lithology types involved in the consolidation works.

## Lithology.

Alluvial deposits (gravel) with variable thickness from 4.5 to 5 m on a more consistent sandy-silty substrate (Fig. 2).



## Description of works.

The works of consolidation were carried out using the **Pacchiosi Jet Grouting System 1 (PS1)**.

Before starting the actual works, a field test was performed to determine the most suitable injection parameters (Fig. 3). For this purpose 4 columns were built, varying the composition of the mixture and injection time.

Fig. 3. Pictures of the test field columns. The significant amounts of water at the site are clearly visible.

The work consisted of the construction of a waterproofing diaphragm with consolidating functions as well, consisting of about 2782 interwoven columns, averaging 5 m in length and arranged in 116 rows (Fig. 4).

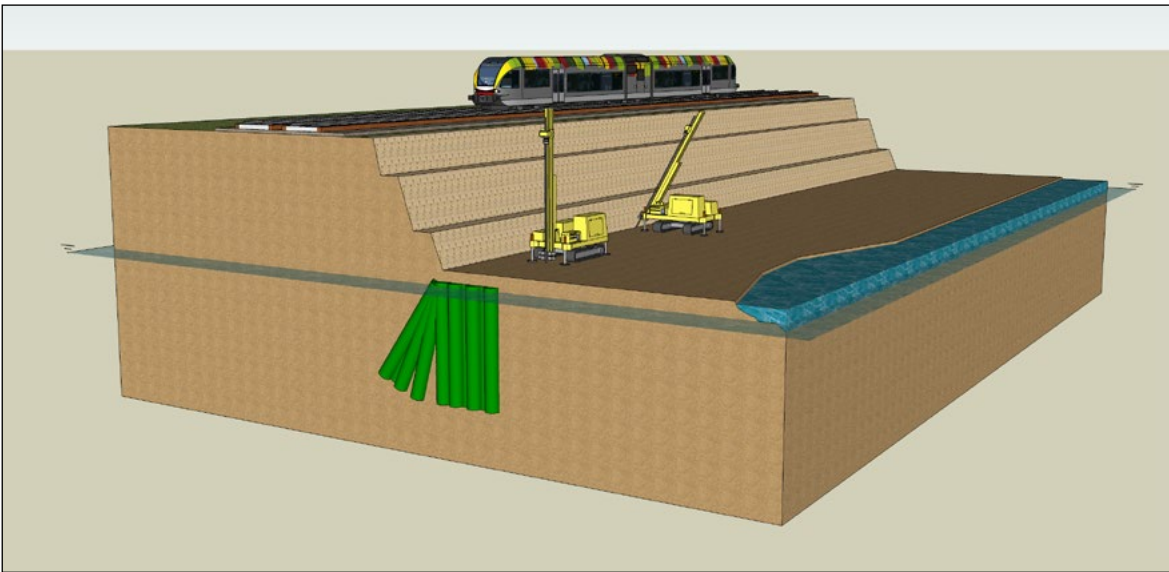
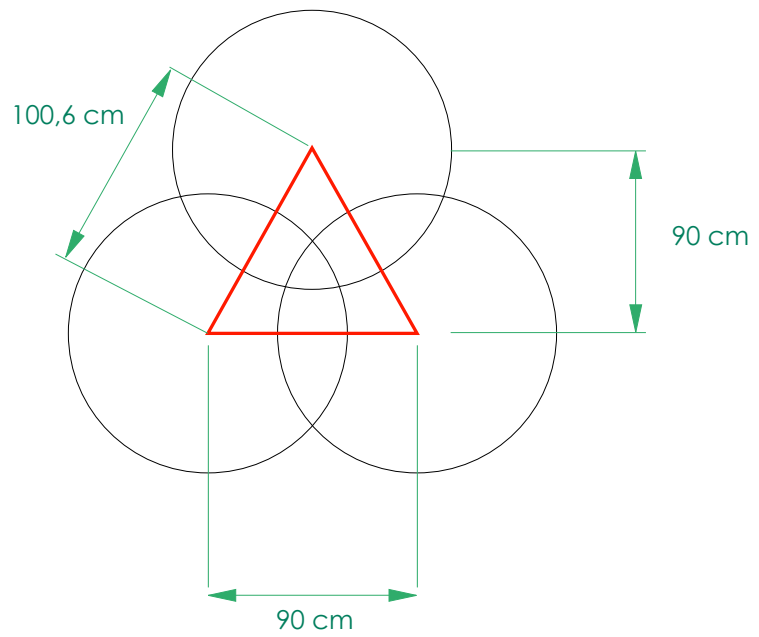


Fig. 4. 3D sketch of the works.

Fig. 5. Detail of the lay-out of the columns in the diaphragm for waterproofing and consolidation.



The column centers are arranged at the points of an isosceles triangle with a base of 0.9 m and side of about 1 m (Fig. 5).

The diameters of the columns are variable between 0.75 m and 1.2 m.

The columns have variable angle (Fig. 6):

- 0° from row n. 1 up to row n. 112;
- 15° for row n. 113;
- 25° for row n. 114;
- 30° for row n. 115;
- 35° for row n. 116.

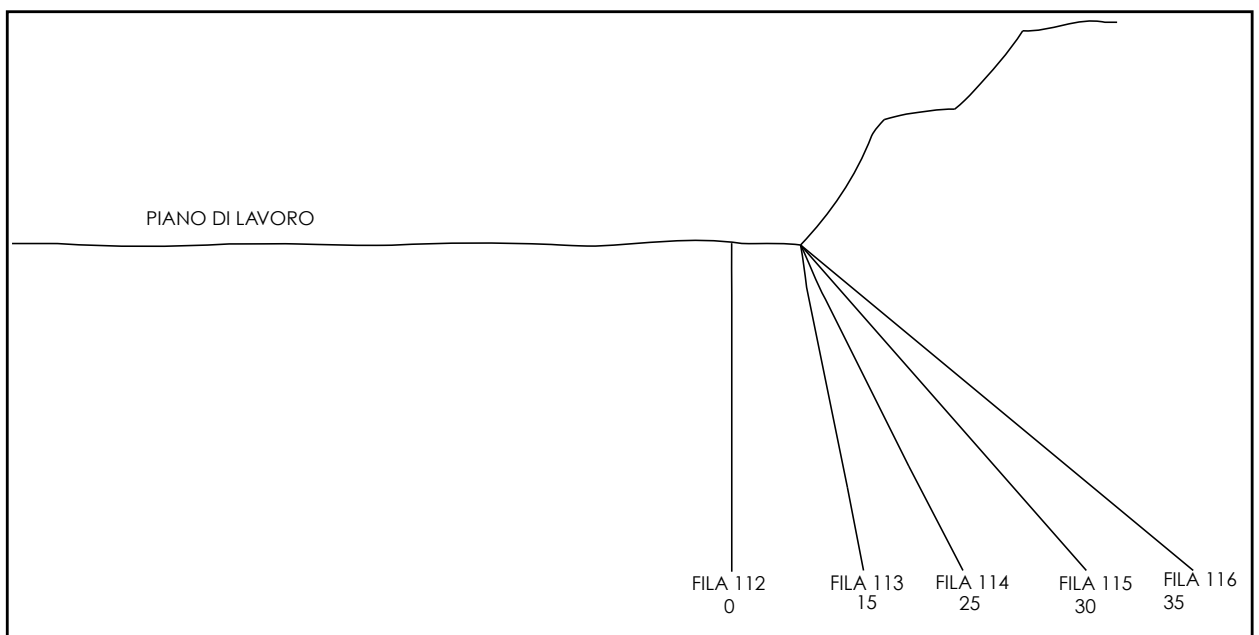


Fig. 6. Sketch showing columns angles.



A complete installation plant (silos, turbomixer, high pressure pump and various workshops) was built in the immediate vicinity of the railroad line (Fig. 7).



Fig. 7. Installation plant located near the tracks.

---

ROCK - SOIL TECHNOLOGY AND EQUIPMENTS

---



**COMPANY WITH  
QUALITY SYSTEM  
CERTIFIED BY DNV GL  
= ISO 9001:2015 =**

Branches

AMERIQUE DU NORD PACCHIOSI INC, Canada

PACCHIOSI DRILL USA INC, USA

**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](mailto: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](http://www.drillpac.com)

