ROMA (ITALY) (ITALY)









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PROJECT:

Construction of bottom plugs with Jet Grouting technology, during works for the extension of Rome subway A line.

PERIOD OF EXECUTION:

November 1993 - March 1995

CLIENT:

Vianini Lavori - Novametro



Fig. 1. 3D sketch of project.





Purpose of the work, difficulties encountered and solutions applied.

The construction of the artificial tunnels for extension of the Rome subway A line required the excavation of a trench supported at the sides by bulkhead (thickness 80 cm and average depth 20 m) and waterproofing by means of a bottom plug (Fig. 1). The works had to be carried out from the surface, in limited space and in the presence of the surrounding building foundations. It was therefore decided to rehalize the bottom plug using Jet Grouting technology with small sized equipment, to allow pedestrian and some motor vehicle traffic.

Fig. 2. P 1000 and PRP 150 drill rigs.

Lithology.

Alluvial deposits consisting of clay and sandy silt, gravel and sand. The average level of the water table is about 5 meters from ground level.

Description of works.

The works were constructed using the **Pacchiosi Triple Jet Grouting system (PS3)** tested in specific test field erformed at a depth located beneath the piezometric surface, recreating the real conditions of the bottom plug construction (Fig.3).

The works were carried out with a network of quincunx columns (99 x 85.7 cm - Fig. 4), having a length from 2.50 m to 7.80 meters, at a depth between 6 and 17 meters from the road surface.



Fig. 3. View of test field.

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Fig. 4. Lay-out of bottom plug jet grouting columns.

was constantly controlled, in order to prevent swellings that could have damaged the adjacent buildings and structures, and block the pipelines or cellars.

During the works separations were found in the elements forming the bulkheads, and these had to be sealed with Jet Grouting technology (Fig. 5 - 6). Excavation of the artificial tunnel uncovered columns having a variable diameter from a minimum of 1300 to a maximum of 2400 mm.



Fig. 6. Intervention on bulkheads.



The columns had to intersect, so as to form a network with uniform features of strength

and impermeability. The tre-

atment had to be carried out in the presence of a high level of water so that, in some cases,

the Jet Grouting system was used to hold back influxes of water along the joints of the bulkheads. During construction of the columns, the capaci-

ty of the injection waste water

Fig. 5. View of a window between the panels forming the bulkheads.

BOTTOM PLUG





Fig. 7. Steps of bottom plug columns rehalizations..





Fig. 8. Core sampling phase.

Fig. 9. Core samples from production columns.







Fig. 10 - 12. Views of tunnel excavation.



Fig. 13 - 15. Views of installations.





BOTTOM PLUG

ROCK - SOIL TECHNOLOGY AND EQUIPMENTS



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

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