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ROCK - SOIL TECHNOLOGY AND EQUIPMENTS

PACCHIOSI DRILL

DEEP FOUNDATIONS

VITTORIO VENETO (TREVISO - ITALY)

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PROJECT:

Consolidation of foundation soil for the pillars of "Fadalto" viaduct during the construction of the A27 motorway Mestre - Pian di Vedoia, section from Vittorio Veneto to Pian di Vedoia.

PERIOD OF EXECUTION:

1989- 1990

CLIENT:

Società Autostrade S.p.A.

Fig. 1. View of the valley in which the Fadalto viaduct will be built.

Purpose of the work, difficulty encountered and solutions used.

The Fadalto viaduct (Fig. 1) (3,700 meters long) consisting of two separate lanes, one for each direction of traffic, had to be built on independent piles, for an expected height of over 60 meters. The mechanical features of the foundation terrain and geomorphological conditions of the detritus cover made it necessary to produce the foundations using different methods:

- shaft foundations (rocky substrate within 30 m of depth);
- direct foundation (rocky substrate below 30 m depth).

Lithology.

Alluvial deposits consisting of calcareous clasts of variable dimensions (0.5-10 cm), englobed in a sandy-silty matrix with local levels of clay and large blocks. The detritus cover, variable in thickness from 25 to 70 m, covers the valley side, forming a slope with an angle of about 30°

Descrizione dell'intervento.

The particular nature of the detritus cover (low percentage of fine material and a large number of voids) led us prefer the **Pacchiosi Jet Grouting System 1 (PS1)**. The system, tested with the rehalization of a specific test field, made it possible to optimize the injection parameters depending on the terrain to be treated. The control holes, made with continuous core sampling, provided samples of consolidated soil with up to 18 Mpa resistance to simple compression. For both foundation methods, a bulkhead was first built in Jet Grouting reinforced concrete (laid out in a U shape towards the valley) as a "protective collar" upstream of all the pillars, consisting of 73 reinforced concrete columns (Fig. 2 - 3).

The procedure involved the following steps:

construction of Jet Grouting columns from 9 to 20 m long with a diameter of 120 cm (Fig. 4);

- reperforation in the nucleus, with installation of metal reinforcement and injection of cement mortar;

Fig. 2.Lay-out of the columns forming the protective collars.

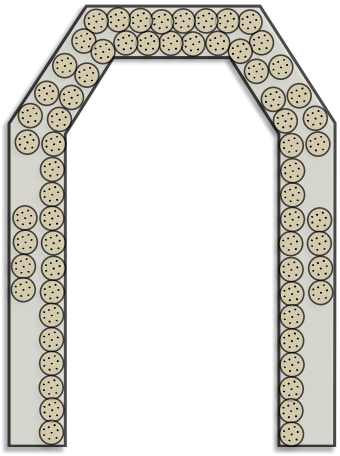

Fig. 3. Cross section of the protective collar around the pillar.

- construction of a beam in reinforced concrete on the crown of the bulkhead, to connect the structures emerging from the jet columns (Fig. 5);

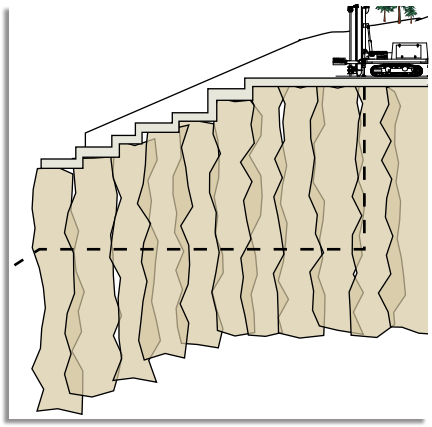

Fig. 5. View of the beam on the crown of the protective collar.

Fig. 4. P 800 drill rig executing the Jet Grouting columns to form the protective collar.

- excavation of the terrain around the perimeter of the bulkhead to the height required by the foundation (Fig. 6).

Shaft foundation.

The procedure for construction of the shaft foundation consisted of the following steps:

Fig. 6. Excavation for the construction of the foundations.

- construction of two rows of Jet Grouting columns, using the PS1 system, with a diameter of 120 cm and spacing of 100 for the external row, diameter of 80 cm and spacing of 60 cm for the inner row (Fig. 7 - 8);• reperforation of the nucleus, installation of metal reinforcement (pipe with a diameter Ø of 101.6 mm and a thickness of 8 mm) and injection of cement mortar;

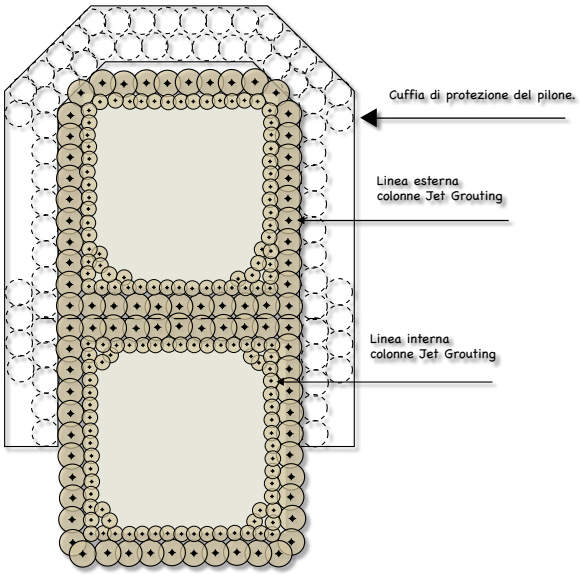

Fig. 7. Lay-out of JEt grouting columns forming the shaft foundation.

Fig. 8. P 1000 drill rig during the rehalization of Jet Grouting columns.

- excavation of the shafts inside the bulkhead to a depth between 17 and 24 m (Fig. 9);
- filling of shafts with reinforced concrete.
- A total of 22 shaft foundations were built.

Fig. 9. Excavation of the shaft.

Direct foundation.

The direct foundation was built with 162 reinforced jet columns, arranged in a quincunx pattern with 11 rows (Fig. 10). The procedure consisted of the following steps

- execution of Jet Grouting columns by means of PS1 system, with a diameter of 80 cm;
- ßinjection of cement mortar through the valves by means of packers.
- A total of 12 direct foundations were built.

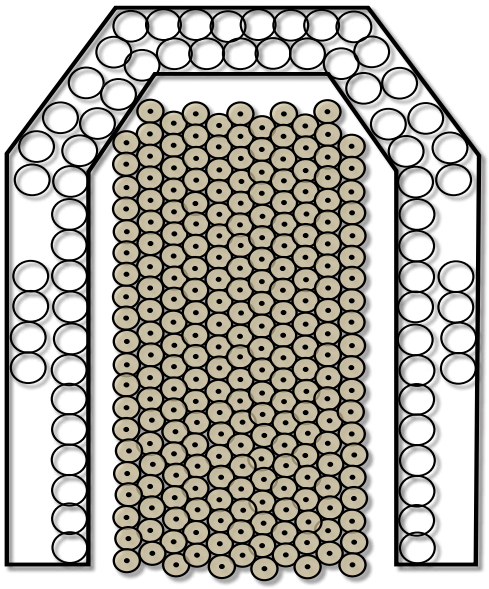

Fig. 10. Lay-out of Jet Grouting columns forming the direct foundation.

Fig. 11. PRP 105 drill rig during the reperforation of the columns' nucleus.

Fig. 12. View of columns' reinforcements.

A total of 12 direct foundations were built. Due to the steepness of the terrain, the foundations were built with a step base (Fig. 13); only under particularly favorable conditions was it possible to build foundations with a flat base (Fig. 14).

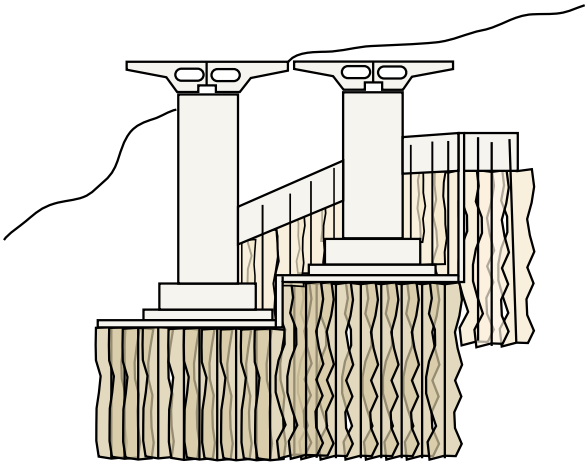

Fig. 13. Direct foundation with stepped base.

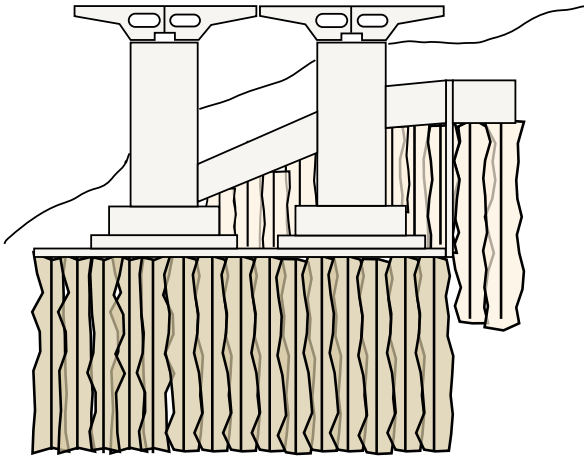

Fig. 14. Direct foundation with flat base.

Fig. 15. View of the viaduct's pillars.

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