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ROCK - SOIL TECHNOLOGY AND EQUIPMENTS

PACCHIOSI DRILL

CONSOLIDATIONS

ISOLA SERAFINI (PIACENZA - ITALY)

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PROJECT:

Consolidation and stabilization of caissons 3AS, 4AS, 5AS and 4SD of the power plant at Isola Serafini – Monticelli d'Ongina (PC).

PERIOD OF EXECUTION :

March 2000 - September 2001

CLIENT :

ENEL

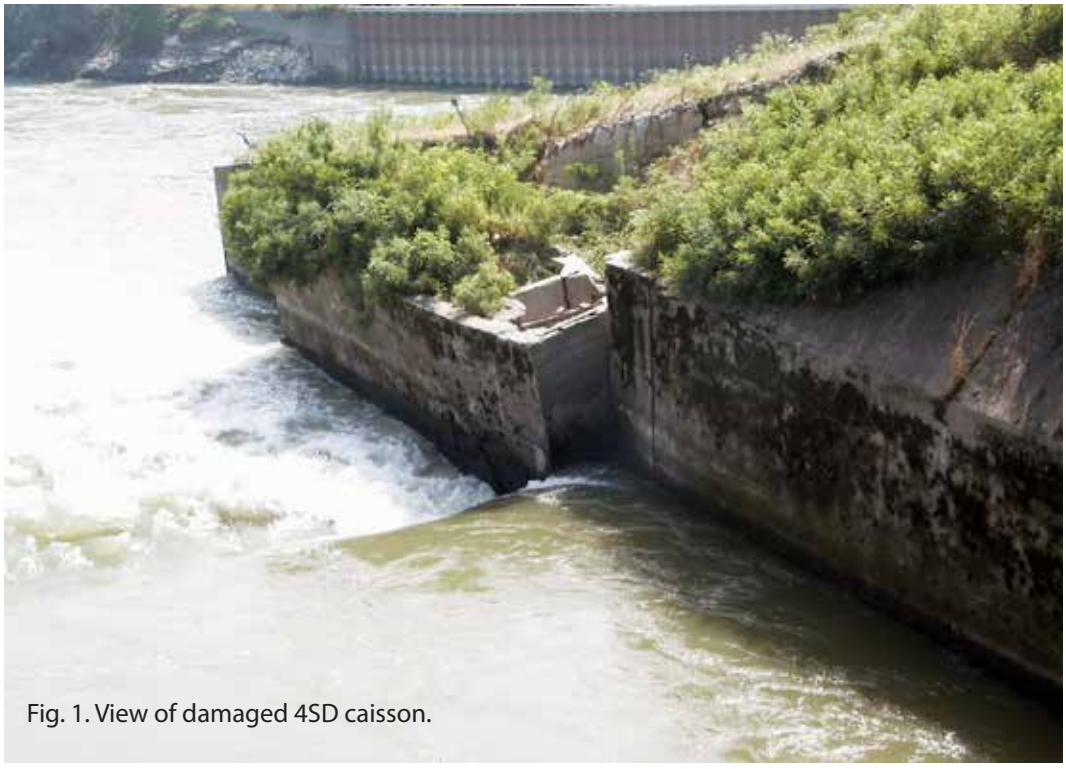

Fig. 1. View of damaged 4SD caisson.

Purpose of the work, difficulties and solutions applied.

The Isola Serafini power plant, built on a broad curve in the Po river in the municipality of Monticelli d'Ongina (PC), consists of a dam, an inlet and a discharge channel. Over the years, the bed of the discharge channel has sunk, during to the scouring action of the river's flood tides, when large quantities of water flooded the channel.

This caused movement and partial rotation of one of the self-sinking caissons (4SD), built on the right bank (Fig. 1). The risk of further movement made it necessary to

perform works of consolidation and recovery of the caisson structure (Fig. 2).

Early signs of erosion were also involving the foundation soil of caissons 3AS, 4AS and 5AS, also on the river bank to the right of the inlet. ENEL, therefore decided to extend the works to these structures. Works on both areas were performed using different methods and are therefore described separately.

Fig. 2. View of caisson 4SD after the works.

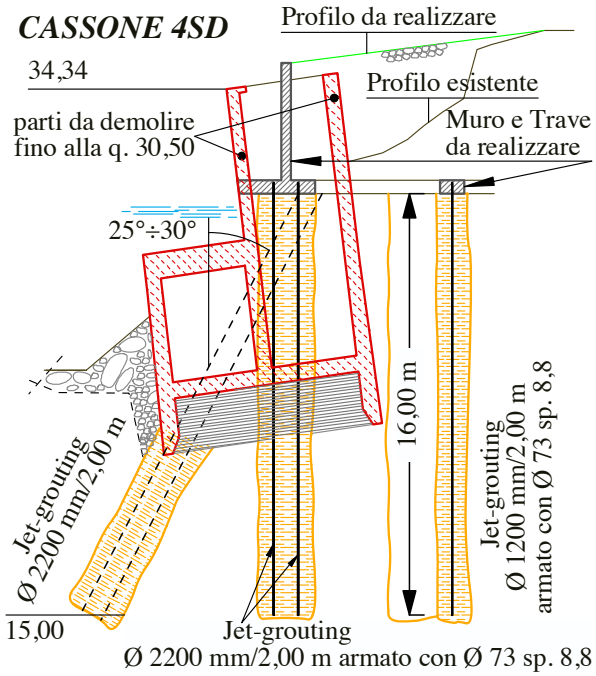

Fig. 3. Sketch of the works

Lithology.

Fluvial deposits consisting of sand and silty sand with levels of fine gravel.

Description of works.

Caisson 4SD (Fig. 3).

The works were performed in four stages:

- demolition of the upper part of the caisson;
- consolidation of the lower structure;
- construction of a wall in reinforced concrete;
- reburying of the caisson.

The works of consolidation were carried out using **PACCHIOSI PRS3** technology.

The works required 3 different treatments:

1. Consolidation and waterproofing of the foundation soil under the caisson.

The work was done with two row of quincunx columns spaced 1 m apart, with the following characteristics:

- a Spacing: 2 m;
- a Diameter: 2,50 m;
- a Lungth: 6-8 m;
- a Angle: variable between 25° and 30°.

Fig. 4. P 1500 ESCR drill rig for Jet Grouting.

The construction of every column was preceded by core sampling of the caisson structure in reinforced concrete.

2. Consolidation of the foundation soil for the new riverbank structure (Fig.4). The work consists of the construction of two rows of quincunx columns, spaced 1 m apart, with the following characteristics:

- a Spacing: 2 m;
- a Diameter: 2,50 m;
- a Lungth: 15,5 m;
- a Angle: 0°;
- a Reinforcement: steel pipe D. 73 mm, thickness. 8,8 mm.

The construction of every column was preceded by core sampling of the caisson structure in reinforced concrete.

3. Construction of a diaphragm behind the caisson for anchorage of the new structure. The work consisted of construction of a row of columns integrated with extra columns to form T-shaped extension:

- a Spacing: 1 m;
- a Diameter: 1 m;
- a Lungth: 15,5 m;
- a Angle: 0°;
- a Reinforcement: steel pipe D. 73 mm, thickness. 8,8 mm.

The works of consolidation were followed by construction of the new structure in reinforced concrete (Fig. 5), reburying the caisson and construction of a stone facing.

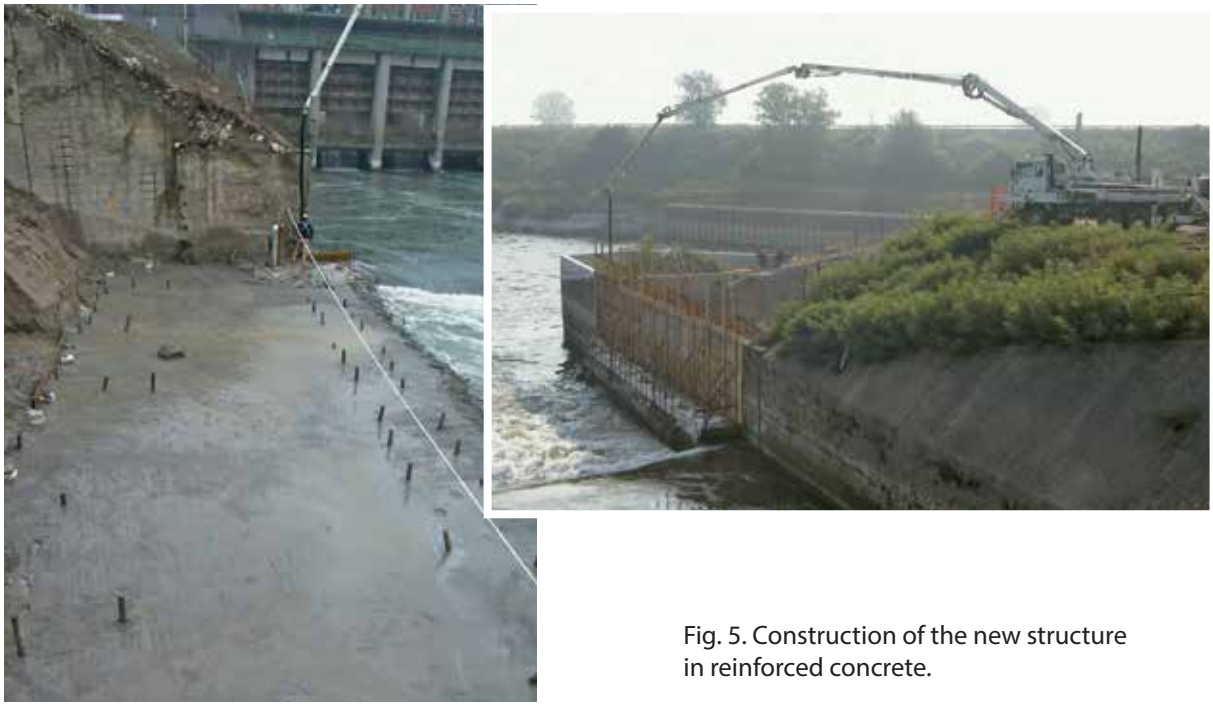

Fig. 5. Construction of the new structure in reinforced concrete.

Caissons 3AS, 4AS e 5AS (Fig 6).

The works of consolidation of the foundation soil under the caissons were carried out with the same Jet Grouting technology (PS3) used for the previous works. The treatment was done at a distance of about 2 m from the outer edge of the caissons with two rows of quincunx columns 0.9 m apart, having the following characteristics:

- a Spacing: 2 m;
- a Diameter: 2,20 m;
- a Lungth: 3-6 m;
- a Angle: variable between 3° and 18°.

The construction of every column was preceded by core sampling of the caisson structure in reinforced concrete. The control holes were made with continuous core sampling. The consolidated soil samples gave values of resistance to compression between 12 and 25 Mpa, higher than the minimum established by the project specifications.

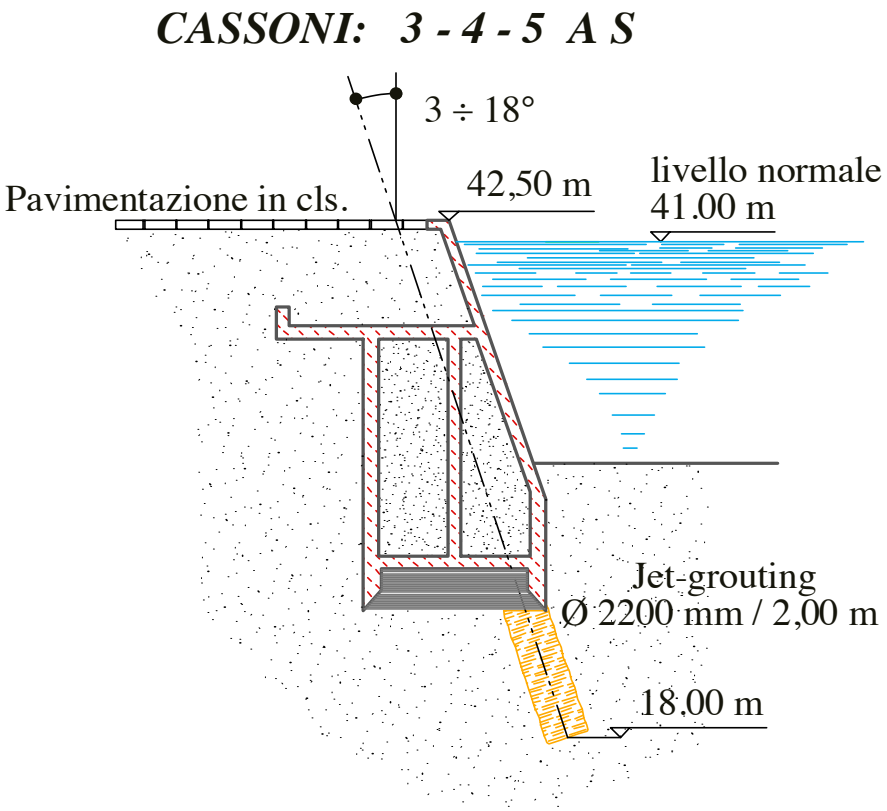

Fig. 6. Sketch of inervention.

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