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APPLICATION OF EC 7 STANDARDS IN DEFINING GEOTECHNICAL CONDITIONS FOR THE KILN FOUNDATION OF CEMENT FACTORY "HOLCIM - SERBIA"

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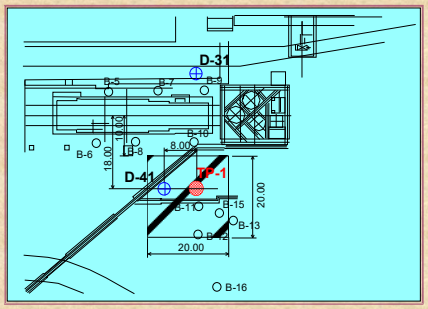
Investigations:

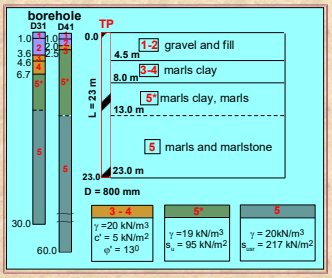
- 28 investigational borings at depths of 10 – 60 m,
- 77 soil samples that were taken and tested in the laboratories, in borehole (D41) 7 pressuremeter tests,
- In the near vicinity of borehole D41a pile has been constructed and static pile load test has been carried out.



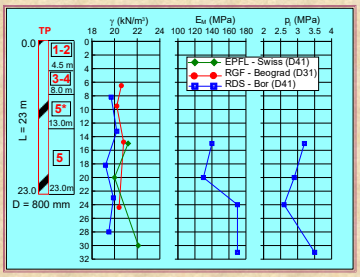
Site situation with the location of the test pile and investigational boreholes

Geotechnics characteristics of the location:

- The base of the soil is built out of neogenous sediments, namely marls and marls clay sediments.
- The deeper part of the terrain is represented by grey-dark marls while the surface part can be characterized as the "zone of changed marls".
- Over the Neogene complex, a thin quaternary layer of clays and terrace large-grained gravel of river Crnica has been formed. The terrain surface has been covered by fill of crushed stone.



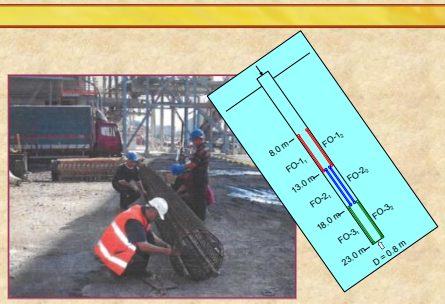
Physical-mechanical characteristics and accepted geotechnical terrain model



Results of pressuremeter tests in borehole D41

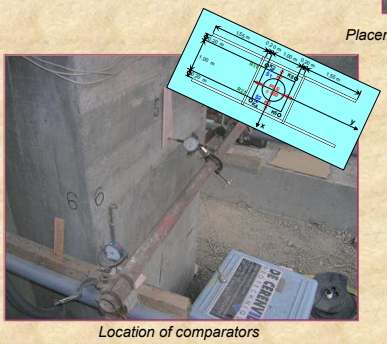
Static pile load test:

- Reinforced concrete bored pile 800 mm in diameter (D) and 23.0 m in length (L).
- Ballast mass was 650 t.
- Fibre-optic deformation sensors 5 m in length, and they were placed at depths of 8-13 m, 13-18 m and 18-23 m.

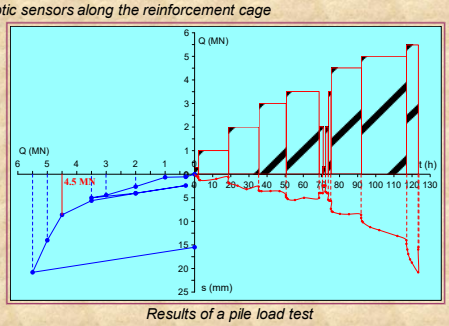


Placement of fibre optic sensors along the reinforcement cage

Static load test structure



Location of comparators



Results of a pile load test

Bearing capacity analysis of the pile with EC 7 standards:

$$R_d = R_k / \gamma_t \quad ; \quad R_d = \frac{R_{b,k}}{\gamma_b} + \frac{R_{s,k}}{\gamma_s}$$

$R_{b,k}$ - limiting bearing capacity of pile base
$R_{s,k}$ – limiting bearing capacity of pile shaft
γ_t, γ_b, γ_s, - partial factors for total bearing capacity or individual bearing capacity of base and shaft.

$$R_k = R / \xi$$

R bearing capacity of the pile which has been obtained by: measurements (R_m – pile load test), or calculated (R_{cal} – based on the results of soil investigations).

$$R_k = Min\left\{\frac{(R_{cal})mean}{\xi_3}; \frac{(R_{cal})min}{\xi_4}\right\}$$

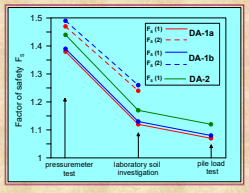
Based on the soil investigation results

$$R_k = Min\left\{\frac{(R_m)mean}{\xi_1}; \frac{(R_m)\min}{\xi_2}\right\}$$

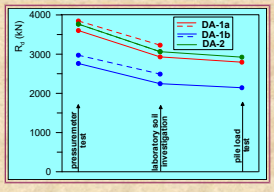
Based on the results of pile load test

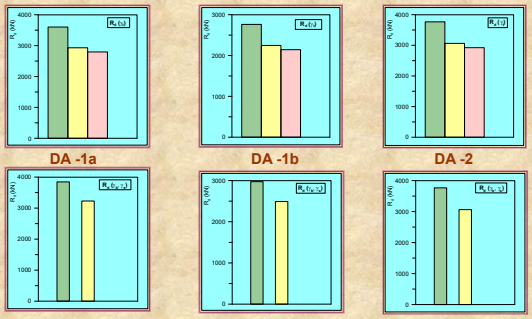
The analysis has been performed for permanent load G_k = 1600 kN and for variable load Q_k = 300 kN.

A - partial factors on actions dependent on the applied approaches			
DA-1	a	γ_G=1.35; γ_Q=1.5	2610
	b	γ_G=1.0; γ_Q=1.3	1990
DA-2		γ_G=1.35; γ_Q=1.5	2610



R - partial resistance factors dependent on applied approaches		
DA-1	a	γ_t=1.15; γ_b=1.25; γ_s=1.0
	b	γ_t=1.5; γ_b=1.6; γ_s=1.3
DA-2		γ_t=1.1; γ_b=1.1; γ_s=1.1





- pressuremeter test; - laboratory soil investigation; - pile load test