Bulletin of the *Transilvania* University of Braşov • Vol. 5 (54) - 2012
Series 1: Special Issue No. 1

EFFECTIVE FOUNDATION OF AN INDUSTRIAL BUILDING ON VARIED FIELD CONDITIONS

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Abstract: *This study examines the evolution of a site investigation work in Brasov county that will build an industrial building with one level and partially with two of them. Foundation soil is different. Estimated settlements led to differential subsidence of about 0.0025 between the eastern and western areas of the study site. Although theoretically we can calculate sizes of foundations so that the resulting settlements fall within acceptable limits two alternatives were proposed to improve the subsoil: a general ballast blanket - or a local ballast blanket under the roof pillars, a local improvement with columns of granular material which is carried out by tamping.*

Key words: *soil investigation, soil improvement, uniforming the foundation soil*

1. Introduction

The settling phase of the subsoil investigation is treated, especially in recent years, primarily by financial criteria and generally as a routine activity. This study examines the evolution of a site investigation work in Brasov county that will build an industrial building with one level and partially with two of them. Structure of resistance will be made of concrete frames with masonry filler on concrete foundations, continuous underneath and insulated masonry beneath the pillars. For reasons of functionality the ± 0.00 quota construction was set at one meter above the current share of the land.

2. Geological Context

The studied location is, in terms of geomorphology, on the Ghimbăşe river's terrace and, in a more general framework, in the Brasov Depression. The entire depression has a Cretaceous foundation, with uneven cuvettes - horst and graben sites. Romanian - Dacian formations were deposited at the base, composed of a marly - sandy complex with alternate layers of coal, over which sat Pleistocene gravel and sand.

To understand the varied lithology, remember that the Quaternary glacial period was composed of at least 7 periods of glaciation - interglaciation. The torrents formed by the melting snow on the mountain frame brought, with rhythm that was at least a seasonal, a significant

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contribution of debris. The transmission power of these streams varied with the changing of the landscape, thereby accumulating finer material, sorted, sandy clay, when quiet bays formed, or, conversely, with coarse material, gravel, cobble and sand, heterogeneous when the differences in rates between the power source and the point where the water was higher Debus. Moreover, the climate was also variable, glaciation starting in the lower Villafranchian with a harsh climate, then alternating with softer climates or, in terms of rainfall, it being either excessive, either dry etc. with the respective consequences in the lithological structure. We have insisted a bit on the geological past to highlight the fact that despite the perception that the surface appearance of the Depression plain induces the feeling that the ground is homogeneous, in depth, history is reflected in an uneven stratification.

From a lithological viewpoint, the formations found on this Quaternary age terrace of consist of gravel, cobble and sand, and, on the surface, on a relatively small thickness of, an altering layers of these, the layer being made up of a cohesive material - sand-dusty, silty - sand. The terrain is relatively flat with a slight slope to the north.

3. Direct Field Investigations

To identify the stratification, there were performed four drillings with continuous coring, and 10 super heavy dynamic penetrations of a 6.0 meters depth (positioned on the situation plane), 3 of them backed up by a borehole reference. From the cohesive material of the surface, undisturbed samples were collected which laboratory tests were conducted (oedometer tests, plastic and particle size analysis), and, in the non-cohesive material (sandy gravel), standard penetration tests (SPT) were made.

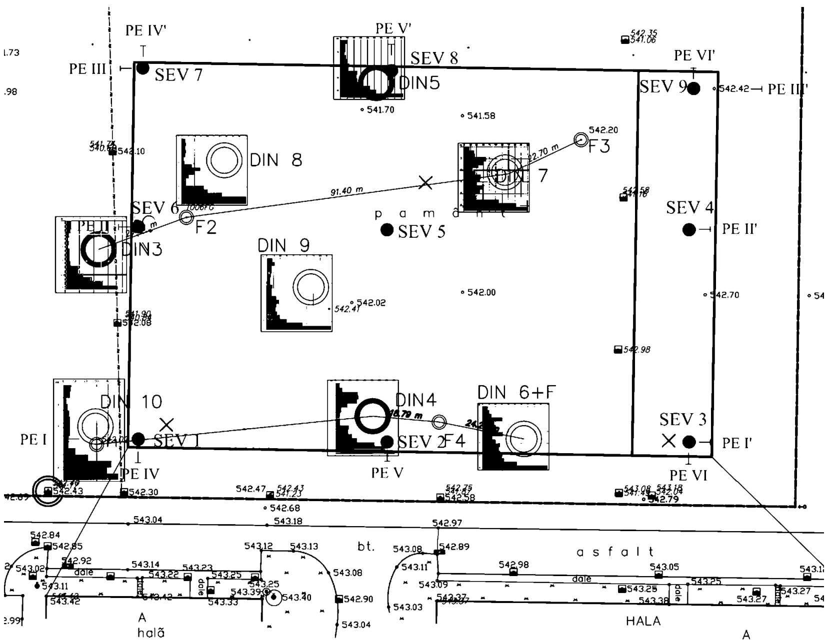

Fig. 1. *Situation plan with investigations (scale 1:1500, F- geotechnical drillings; DIN - dynamics penetration; SEV - vertical electrical sounding)*

The correspondence between dynamic penetration and stratification was based on comparison with the reference drillings

Geophysical Investigations - Geophysical investigations were also conducted through the electric survey method on 9 vertical profiles. Geoelectrical measurements were performed through the resistivity method using the electrical vertical survey process (EVS), according to ASTM G-57-95 (reapproved in 2001).

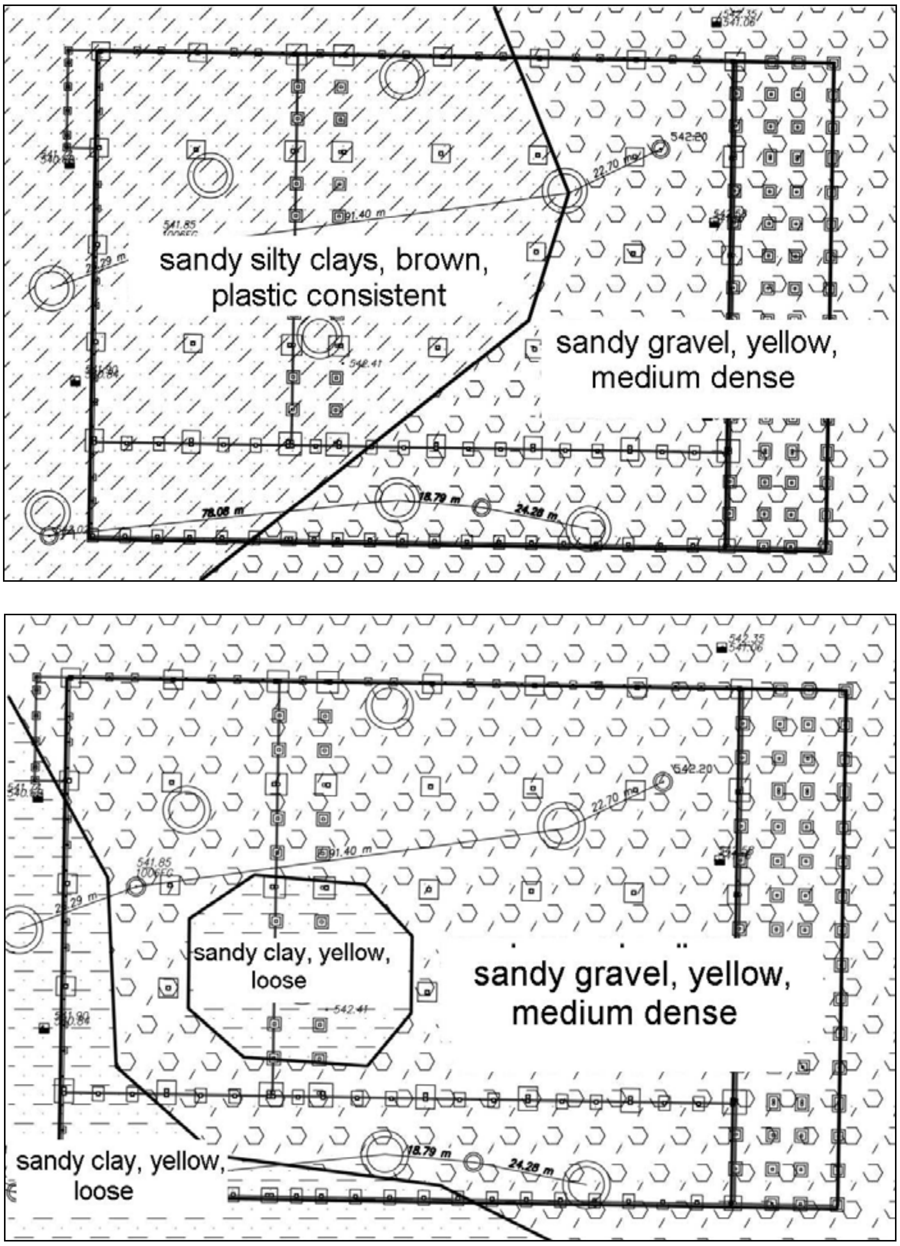

Fig. 2. *Lithology at different depths*

The principle of the used method consists of injecting a current in the basement of a known intensity (I) through two current electrodes (A, B) and measuring the potential difference (Δ V) with another pair of potential electrodes (M, N).

4. Investigation Results

On the surface, on most of the site there is a vegetable soil with a relatively large thickness, and past it, to a depth of 1.20 to 1.80 m follows a sandy dust whose blackish colour indicates the possibility of a highly organic content, which is inappropriate for a foundation soil.

Surveys have revealed that the bedrock consists of gravel and cobble with sand dust (which in principle has a thickness of over 200 meters) and is located at a depth of over 4.00 meters in the west, while in the eastern area it is intercepted from the surface, the land having been subject to prior etching. Over this lays a sequence of cohesive materials with low consistency or loose sand.

Geophysical investigations have determined the groundwater depth to be 10 to 12 m from the surface.

Quantitative interpretation results show the following:

Layer I: filling with thickness between: 0.20 to 1.30 m, ρ s = 81 to 533 Ω m;

Layer II: sandy silty clays u to the depth of : 1.40 to 2.90 m, ρ s = 33 to 47 Ω m;

Layer III non-cohesive horizon consisting of sands, gravels and boulders in dry state, up to depths of approx. 11.00 to 12.00 meters, after which they are found under hydrostatic level.

After finishing field investigations, the general designer moved the proposed site eastward, so we were forced to rely solely on geophysical investigations in this area.

5. Conclusions

The foundation soil is different, as can be seen in Figure 2, "Lithology land at different depths." Estimated settlements of foundations for the same size of the foundation considering the actual pressure communicated by the designer led to differential settlements of about 0.0025 between the eastern (foundation soil with sandy gravel) and Western (with cohesive foundation soil, loamy sand), which is unacceptable according to the Romanian norm (NP 112-04) and the Eurocode 7.

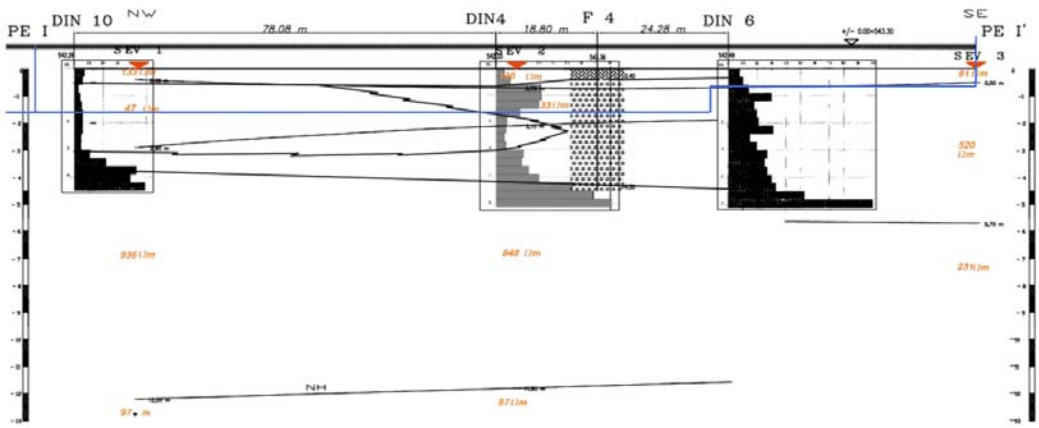

Fig 3. *Geotechnical profile (PE I - PE I ')*

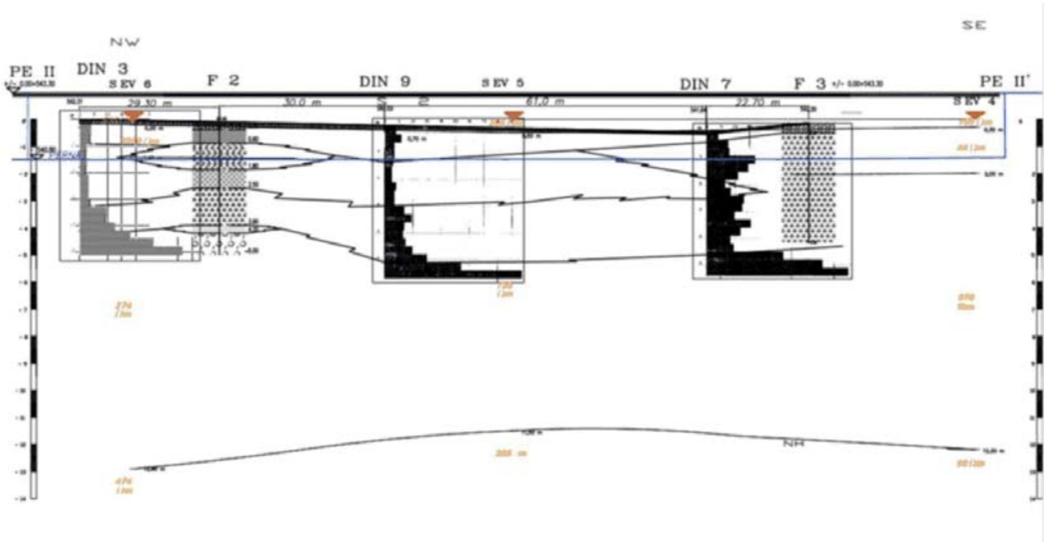

Fig 4. *Geotechnical profile (PE I - PE I ')*

Although theoretically we can calculate different sizes of foundations so that the resulting settlements fall within acceptable limits, we believe that this is risky and difficult to implement, both in terms of execution and the reliable information on land which can only be punctual.

Therefore we argued primarily for the homogenisation o the foundation soil. Otherwise we would have risked that a direct foundation to force the contractor to reach the same foundation soil (sandy gravel and cobble) step by step, to relatively large depths of over 4.00 meters from the current ground 5.00 meters from the quota of the arranged ground which would have resulted in onerous costs.

The two options for improving the foundation soil that we have proposed, among other possible ones [5], are as follows:

I. foundation on a general ballast blanket. Estimated thickness of the blanket is approx. 2.50 m (of which approx. 1.5 m below the base foundation).

II. founding on a local ballast blanket - Blankets will be of two types:
- For areas with higher loads on the sole foundation (s 7-10 and 1-3) will have an average thickness of one meter below the bottom foundation.
- For areas with lower loads the average thickness of the blanket is 0.60 m

Under the central pillars indicated the on the sketch, we recommend improvements of soil the with columns of granular material (ballast) achieved by tamping. The number of columns will be permanently established experimentally, in the first phase based on the overall weight volume achieved in the improved land as a confirmation, by rigid plate testing. From our point of view, to interpret mechanically the data from direct or indirect exploration, including laboratory tests is quite superficial. In general, the most in-depth investigations do not surpass from a direct analysis point of view millionth of the amount of land considered. Therefore in addition to the sides that help to establish the foundation solution, we added the insight (understood as a synthetic result of the accumulation of knowledge) of the geotechnician or geologist. To foresee or infer certain accidents of the ground, to weigh taking or ignoring their possible deviations from the project must compete for the selection of the foundation solution

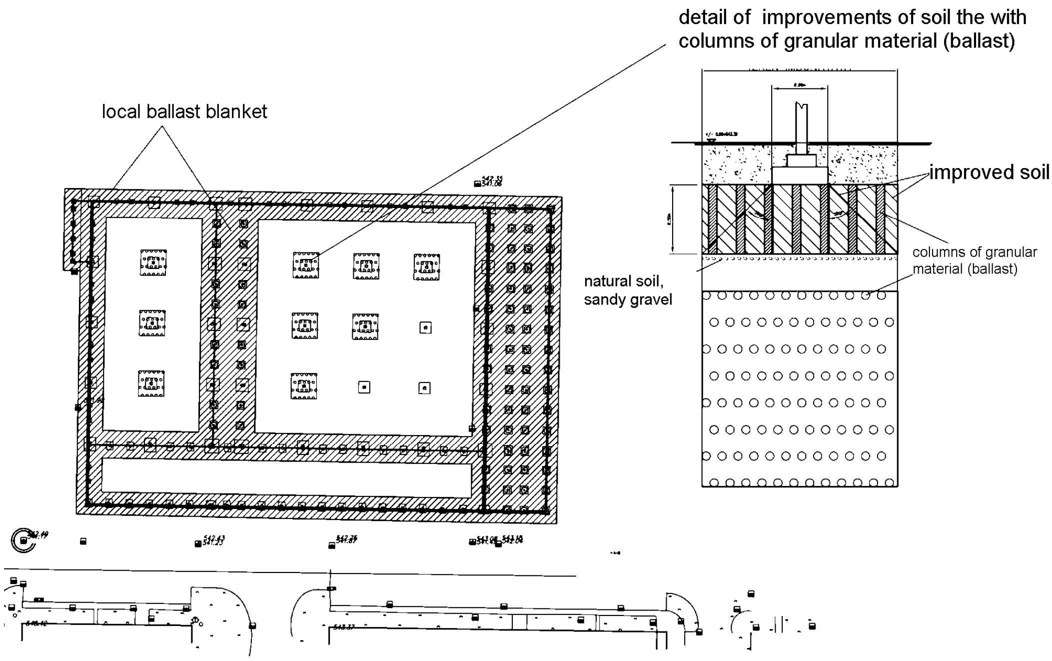

Fig 5. *Improving soil proposal*

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