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Assessment of Structural Foundation's Contribution to the Stability of a Site Susceptible to Sliding

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Abstract

Assessment deep foundation structural system's contribution on stability of a site susceptible to sliding when using "top carrier piles" represents the main objective of this paper .

For this, pile-ground interaction was analyzed in case of full mobilization of the shear resistance soil after dangerous surfaces of yielding.

Afterwards, with the aid of the results obtained, the bundle between the number of structural piles and the number of piles necessary for ensuring the stability of settlement in known soil conditions was established.

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Keywords: pile; slope; stress; displacement; level of assurance.

1. Introduction

The case study presented in the paper starts from the necessity of replacing a direct foundation system into a deep foundation system, on piles, for a residential building with basement + ground floor + two floors + one retracted floor (B+G+ 2F+R).

Replacing the originally designed foundation system was determined by the actual characteristics of the soil raised during the execution of excavation works, essentially different to those specified in the geotechnical study.

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In the situation newly created by soil resumption investigation and interpreting laboratory results obtained on samples of soil taken at the scene, a major risk of loss of stability of the site was revealed and reported, by forming sliding surfaces under the footing.

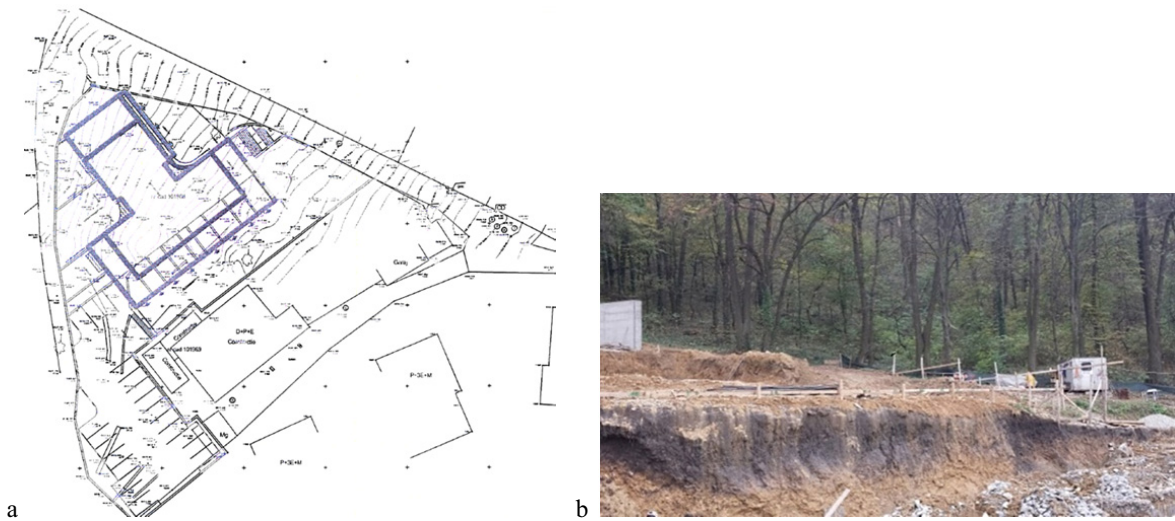


Fig. 1. (a) Proposed site plan; (b) Overview of the site.

1.1. Description of the location

The site investigated is located in Brasov, on the northern slope of the "Melcilor hill", which make part of the "Postavarul Massif", at altitudes between 614 and 624 meters. The slope has an average gradient of 17° : starting from weak inclined slopes (below 7°) to strongly inclined slopes (over 25°), see Fig. 1 a and Fig. 1 b.

Landforms have been developed in this area on white-gray limestone, rarely reddish, by reef-genesis, massive or laminated, that reach hundreds of meters thick. In "Melcilor hill", mass limescale deposits are interspersed by Lower Jurassic sandstones represented predominantly by quartz and marl.

On the lithological boundaries and fault lines formed there are highly fractured rocks showing a high level of degradation. As result of disintegration processes and weathering over bedrock toward the ground surface a delluvial blanket was formed, less consolidated, consisting predominantly of clay in consistent or firm state, with fragments of debris included. The thickness of these superficial deposits is small in the western perimeter on strongly inclined slopes where limestone occurs, while on the slopes of low and moderately sloping, delluvial thickness increases considerably, reaching 7.00 m.

The tilted position of the site, the sequence and lithology layers of soil and the hydrostatic level of groundwater determined the extension of the geotechnical study by checking the stability of the massive, highlighting possible slid surfaces.

1.2. Data on the projected building

The building that will be raised on the investigated site has a variable highness, with two withdrawals practiced from downstream to upstream: B+G+ 2F+R.

The directly foundation system, initial designed, was replaced by a deep foundation system, achieved of drilled piles and a network of crossing beams under lamellar pillars and diaphragms.

The superstructure of building is designed of lamellar pillars and concrete reinforced walls, consolidated in horizontal plane by means level floors.

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