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Geotechnical Properties Lands Foundation for Beceni Windfarm – Buzău County

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Abstract

The paper presents the geotechnical proprieties for the foundations of 12 plots. Following the rules of good practice, a detailed geotechnical study provides information to inform and support final design decisions and construction specification. The boreholes was located on each construction and was made by GTR 790 drilling tool.

The solutions for all pile were direct foundation. The settlements on the final work were very good.

Key words: *geotechnical investigation, foundation, settlement*

Introduction

The geotechnical investigations had been performed for the settlement of 12 wind turbines with the height of 100 m and palettes diameter of 80 m.

According to STAS 11100/93, the location is situated in area 9₂ and $a_g = 0,32$ g and according to the Seismic Projection Code P100/1-2006, for the related area, the peak value of the land acceleration for projection, $a_g = 0,32$ g, and the control period (corner) of the reply spectrum, $T_c=1,5$ s. The freezing depth, according to STAS 6054-77, is of 0,90 m.

Taking into account the provisions of normative NP 074-2007, the geotechnical category was I.

To observe the fact that some locations are situated on versants with inclinations of over 15°.

Geology and geomorphology

From geomorphologic point of view, the location is situated in a hills' area, which pertains to Buzau Subcarpathians. For each location, upon the lithological description, there has been a reference to the inclination of the land. From local point of view, the areas investigated are not affected by erosive processes or landslides. The deposits on which the investigated perimeter is situated are of age Romanian.

Age Romanian ends the series of soft – Pliocene deposits from the curve, occupying a vast area towards the south (over 10 km), with a width that restrains towards the North (up to 1 km) due to extensions of Candesti layers. The resembling facieses that develop both into the upper part of Dacian as well as in Romanian make their delimitation difficult. The beginning of Romanian is marked by disappearance of gritstones that are frequently met into the upper part of Dacian,

and they are replaced by clays, sandy clays and sands. At the same time, we can notice that the lignite layers in Dacian are here replaced by coal clays. Deposit thickness in Romanian is between 600 and 800 m.

The Romanian in this area is characterized by the following paleontological content: *Lithoglyphus acutus acutus* Corb., *Lacutus decipiens* Brus., *Melanopsis (Melanopsis) pterochila* Brus., *Valvata (Cincinna) cobalcescui* Brus., *Planorbarius sulekianus* Brus., *Dreissena polymorpha* Pall., etc.

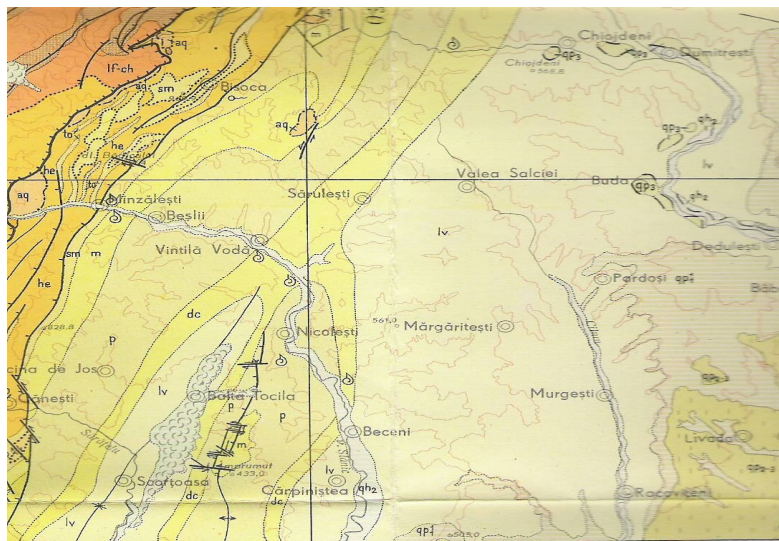


Fig. 1. Geological map of the perimeter (scale 1:200.000)

Investigation of settlement land

The research of settlement land had been made for each location, by the execution of 20 m borehole – for locations situated in slopes – of an additional drilling with 6 m in depth. The drillings had been made by means of the following mechanic installation: Geotool GTR 790 RHB Nordmeyer, and there were only non-turbid samples collected and analyzed in authorized laboratory.

Within the execution phase of the project, additional boreholes are needed into the sloped locations.

From lithological point of view, rocks were described from sands to clays and marls, of which the physical – mechanic characteristics and derived physical parameters are hereinafter identified:

- Humidity: 3,1 – 20,7 %
- Flow limit: 29 – 81%
- Agitation limit: 14 – 23 %
- Plasticity index: 14 – 57%
- Consistence index: 0,75 – 1,0
- Natural volume weight 14,60 – 22,26 kN/cubic meter
- Dry volume weight 13,82 – 20,06 kN/cubic meter
- Porosity 28 – 47%

- Pore index 0,40 – 0,91
- Saturation level 0,12 – 1,0
- Edometric module e_{2-3} 52,63 – 166,66 daN/ cmp
- Settlement coefficient 1,1 – 10,8 cm/ m
- Internal friction angle 14 – 37°
- Cohesion 0 – 34 kPa



Fig. 2: Aspects related to execution of geotechnical drillings.

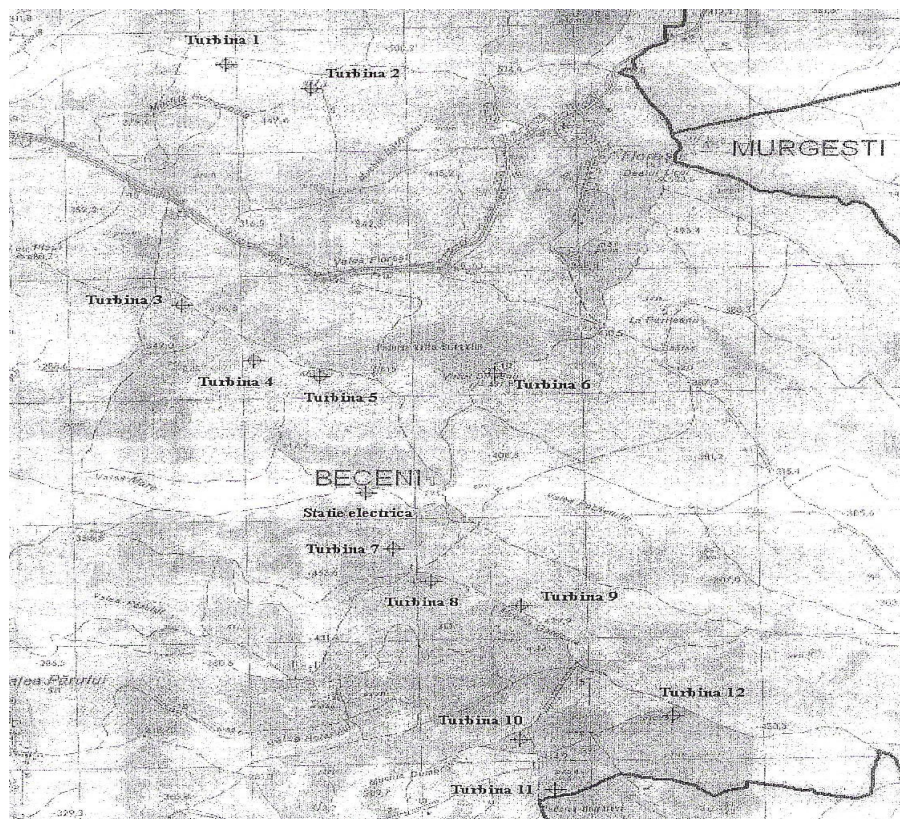


Fig. 3: Settlement of turbine locations.

Conclusions

The carrying capacity had been calculated by means of Romanian standard method for a foundation of the following type: general grill with a width of 12 m and settlement depth of 4 m.

The carrying capacity at the limit deformation state:

$$P_{pl} = m[\gamma B N_1 + (\Gamma g)_{hf} N_2 + c N_3]$$

The carrying capacity at breaking limit state

$$P_{cr} = \gamma' B' N \lambda \gamma + (\Gamma g)_{hf} N q \lambda q + c N c \lambda c$$

The conventional pressure for the foundation, according to STAS 3300/2-85.

The value of carrying capacity to the limit deformation state varied from 310 – 612 kPa, regarding the carrying capacity at breaking limit state from 412 to 912 kPa and in case of conventional pressures, it varied between 526 and 1000 kN/cm².

The settlement calculation had been made for each settlement and these values are more than satisfactory: 1,3 for 3 cm, which is more than the limit imposed by standards.

References

1. *Normative regarding technical documentations for constructions*, Indicative NP 074 – 2007
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Caracteristicile geotehnice ale terenurilor de fundare pentru turbinele parcului eolian Beceni – jud. Buzău

Rezumat

În lucrare sunt prezentate caracteristicile fizico-mecanice și parametrii fizici ai terenurilor de fundare pentru 12 turbine din cadrul parcului eolian Beceni. Sunt prezentate calculele capacităților portante, ai coeficienților de pat și ai tasării pentru fundații directe pe radier general.