PLACEMENT CELL BASED STORAGE AGRICULTURAL PRODUCTS GEOTECHNICAL STUDY

BRUMAR DRAGOMIR, CIOBOATA MARIUS NICOLAE
University of Craiova, Faculty of Agronomy

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ABSTRACT

Geotechnical study is necessary for the foundation soil knowledge for the warehouse adequate placed and is rely on geotechnical soil research works a view to define: rock arrangement; physical and mechanical properties of the fields; allowable bearing pressure of the setting levels; soil settlement; frost depth; seism framing; hydrogeological dates.

INTRODUCTION

The present study has resulted from the necessity to know the foundation terrain in order to properly locate the warehouse for agricultural products.

The location is Cetate, județul Dolj. Morphologically, the location is relatively plain, good for the foundation, with good stability; tectonically features, this place belongs to the Valaha Platform, the Moesic Domain and this zone incorporates neogenical and quaternary formations (neogenical formations was not intercepted by the drills).

MATERIALS AND METHODS

The study comprises geotechnical works made within the establishment zone in order to get the data needed for the solving the basis problems that includes: the stratification of the terrain; the physics-mechanical features of the soil; the admissible pressures at different levels; the probable compaction; the classification of the digging operations; the freezing depth; the seismically classification; hydrogeological data.

There have been made two geotechnical drills and there were taken samples and there were made analyses.

The exploration of the soil has been made by: direct observation, geological survey; the performing of two drills (FG1, FG2) with 100 mm diameter and the depth 5.0 m according with the project; the performing of penetrometer trying at different depths within the bulb zone and the foundation pressures using the light penetrometer; the collecting of disturbed and not disturbed samples and their analysis.

The nature and the phisical status of the foundation has required the calculation of the terrain from the drills, for several depths (0.8; 1; 1.5; 2; 2.5; 3) and for several widths of the foundations (1; 2; 3) according to STAS 3300/1-85 and 3300/2-85.

The calculus of the foundation terrain on the basis of the conventional pressures

With the preliminary or definitive calculus of the foundation terrain on the basis of the conventional pressures there have to be complied the following conditions;

- with centrically loadings:
  - $P_{ef} < P_{conv}$ şi $P'_{ef} < 1.2\ P_{conv}$
- with excentrical loadings on one direction:
  - $P_{ef\ max} < 1{,}2\ P_{conv}$ in the fundamental grouping
  - $P'_{ef\ max} < 1{,}4\ P_{conv}$ in the special grouping
- with loadings with excentricities on both directions:
  - $P_{efmax} < 1{,}4\ P_{conv}$ in the fundamental grouping;
  - $P'_{ef\ max} < 1{,}6\ P_{conv}$ in the special grouping

For lands that are very compresible, the preliminary set up of the foundation dimensions can be made on the basis of the $P_{conv.\ min.}$ for the respective class but it is compulsory the subsequent verification at the limit deformation status (P_{pl}) and of portent capacity (P_{cr}).

Within the very compresibile lands are: the loosened sands and the cohesive lands (clays) with Ic< 0.5 or E>0.90.

The conventional pressures are determined taking account of the basis values P_{conv} from the tables. The basis values from tables correspond to the conventional pressures, with the width of the sole B=2 m. and the depth of foundation Df=2.0 m.

The calculus of the foundation terrain with the limit status of deformation (P_{pl})

In order to accomplish the calculus there must be fulfilled the following conditions:

- for centrical loaded foundations: $P_{ef} < P_{pl}$
- for excentrical loaded foundations: $P_{ef} < P_{pl}$; $P_{ef\ max} < 1.2\ P_{pl}$; $P_{ef\ max} < 1.4\ P_{pl}$

For rectangular foundations in P_{pl} plan it is calculated as follows:

- for buildings without basement: $P_{pl} = ml\ (\gamma\ xBxNl + qxN2 + cxN3)$ kPa
- for buildings with basement: $P_{pl} = ml\ (\gamma\ xBxNl + (2qe+qi)/3xN2 + cxN3)$ kPa,

The absolute probable compaction can be calculated with the formula:

$$S = 100 \times \beta\ (\Sigma\sigma^{med}_{zi} \times hi)/Ei \qquad \text{cm},$$

The calculus of the terrain at the limit status of portent capacity must ensure the following condition: $Q < m \cdot R$

When the resultant of the loading calculus has a declination over the vertical less than 5^0 in the conditions of horizontal stratification, the critical pressure can be calculated with the following relation:

$$P_{cr} = \gamma^* \times B' \times N_\gamma \times \lambda_\gamma + q \times N_q \times \lambda_q + c^* \times Nc \times \lambda_c \qquad , \text{kPa}$$

In the case of the presence under the foundation of a stratification were the shearing features do not vary more than 50% over the average values, there can be adopted for the calculus of the portent capacity the weighted average.

When, within the active zone there appears a weak layer, with a shearing resistance less than 50% the value of the shearing resistance of the superior strata, there will be verified the portent capacity as the foundation would stay directly upon the weak layer.

RESEARCH RESULTS

The location is Cetate, județul Dolj. Morphologically, the location is relatively plain, good for the foundation, with good stability; tectonically features, this place belongs to the Valaha Platform, the Moesic Domain and this zone incorporates neogenical and quaternary formations (neogenical formations was not intercepted by the drills).

There have been made two geotechnical drills (FG1, FG2) with 100 mm diameter and the depth 5.0 m according with the project (figure 1).

The mapping of the aggregate surface area of the analysis results obtained from the drilling geotechnical data of the executed results indicate a uniform stratification in the ground with the vegetal layer.

Geotechnical drillings performed intercepted no aquifer, groundwater level is about 23 meters.

Geotechnical drilling configurations are intercepted by the upper - Pleistocene age and are formed: layer of concrete (0,0 to 0,1 m); yellowish brown silty clays, clays, plastic consistent with the average compressibility, having nests of gravel, very wet (0,1 to 3,3/3,5 m); yellow clay powder, plastic consistent with average compressibility, the very wet wipes (3,3/3,5 to 5,0 m).

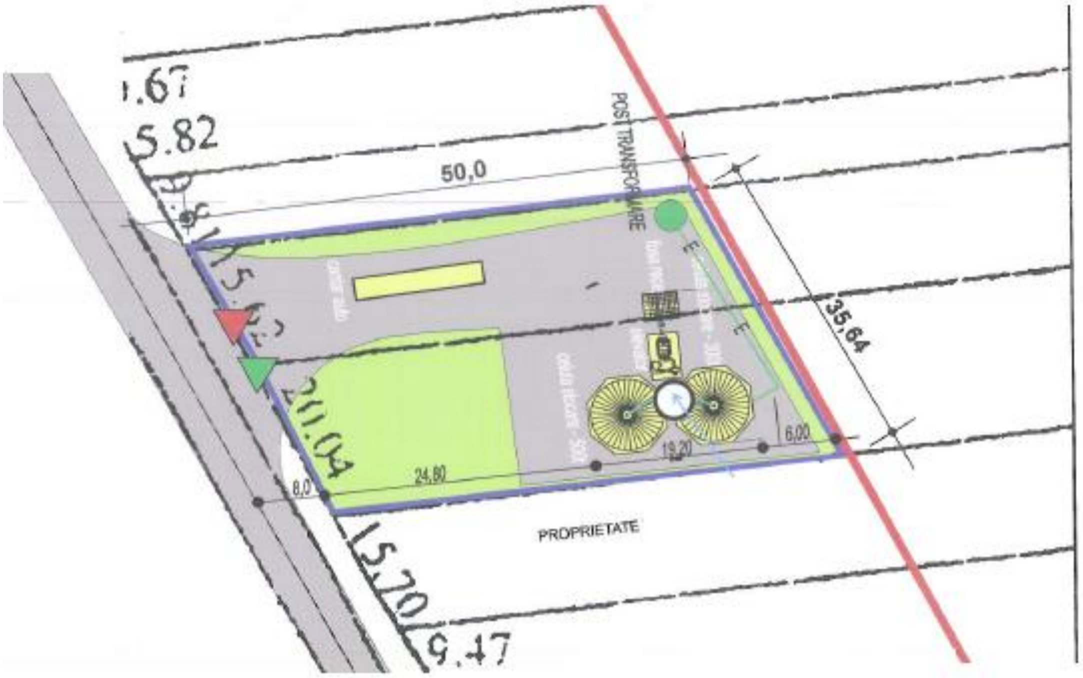

Figure 1 - Geotechnical drills

The laboratory determinations on the physics-mechanicals features of the land (the nature of the terrain) have envisaged (table 1): the moisture w%; consistency index Ic; pore index E; the bulk weight γ**;** the average compresibility M_{2-3}; the internal friction angle ø; cohesion c.

Table 1

The physics-mechanicals features of the digger material (the land nature)

The land nature	Depth (m)	The physics-mechanicals features						
		w %	Ic	E	γ kN/mc	M_{2-3} daN/cm^2	Ø grade	c kPa
layer of concrete	0.1	-	-	-	-	-	-	-
yellowish brown silty clays, clays, plastic consistent with the average compressibility, having nests of gravel, very wet	0.1 - 3.3/3.5	23.0-23.5	0.52-0.55	0.76	18.2 - 18.4	130 - 140	14-15	16-17
yellow clay powder, plastic consistent with average compressibility, the very wet wipes	3,3/3,5 - 5,0	22.3-22.6	0.56-0.57	0.75	18.4 - 18.5	142 - 150	17-18	10-12

Dominant faction is represented by clay, therefore they print the generality rock formations cohesive.

The conventional pressures for the calculus are comprised in the table 2, for foundation depths of (Df = 0.8; 1.0; 1.5; 2.0; 2.5; 3.0) and widths of the foundations of (B = 1.0; 2.0; 3.0).

Table 2

The conventional pressures of calculus (P_{conv}) for different foundation depths and widths (kPa)

Nr. foraj	Foundation depth	The conventional pressures of calculus for different widths of B (m)			The land nature
	(m)	1	2	3	
FG1 FG2	0,8	152	161	165	yellowish brown silty clays, clays, plastic consistent with the average compressibility, having nests of gravel, very wet
	1	167	176	181	
	1.5	176	185	191	
	2	180	189	198	
	2.5	189	214	223	
	3	207	216	226	yellow clay powder, plastic consistent with average compressibility, the very wet wipes

The results of the calculus are written in the table 3 for pressures at the deformation limit status (P_{pl}) and to the limit status for the portent capacity (P_{cr}) and the table 4 for the absolute probable compaction (S) for loadings more than 2.5 daN/cmp with foundation widths of 2.0 m and foundation depths of 1.5 m.

Table 3

The pressures at the limit deformation status (P_{pl}) and at the limit of the portent capacity for different widths (B=1; 2; 3 m) of the foundations and to different depths of foundation (0.8-3 m), drills FG1 and FG2

The calculus	γ kN/mc	ϕ gr	c kPa	ml	Ppl (kPa)			Pcr (kPa)		
					1	2	3	1	2	3
0.8	18.3	15	14	1.5	156.7	161.4	166.2	224.2	237.8	251.3
1	18.0	15	14	1.5	168.1	172.8	177.5	237.2	250.5	263.8
1.5	18.0	14	13	1.5	183.2	187.1	191.1	242.0	253.0	264.1
2	18.0	14	11	1.5	198.4	202.3	206.3	253.5	264.6	275.6
3	13.0	14	11	1.5	207.1	209.9	212.7	261.1	269.1	277.1

P_{pl} = ml (γ xBxNl+(2qe+qi)/3xN2+cxN3) şi $P_{cr} = \gamma$ x BxN_γ x λ_γ +qxN_q $x\lambda_q$+$cxNcx\lambda_c$

Table 4

The absolute, probable compaction under rectangular foundation with the width B of 1.5 m; hf=1.5 m; Pn=2.0 daN/cmp

Layer nr.	Depth (m)	M	MO	E	Zi (m)	B (m)	Zi/B	σ	σ_{zi}	σ^{med}_{zi}	hi (m)	Σ
								(daN/cmp)				
1	1.0-1.5	150	1.2	180	0	1	0	1	2			
					0.5	1	0.5	0.85	1.7	1.85	0.5	0.005
2	1.5-2.0	150	1.2	180	0.5	1	0.5	0.85	1.7			
					1	1	1	0,7	1.4	1.55	0.5	0.004
3	2.0-2.5	145	1.2	174	1	1	1	0.7	1.4			
					1.5	1	1.5	0.55	1.1	1.25	0.5	0.003
4	2.5-3.0	145	1.2	174	1.5	1	1.5	0.55	1.1			
					2	1	2	0.43	0.86	0.98	0.5	0.002
5	3.0-3.5	145	1.2	174	2	1	2	0.43	0.86			
					2.5	1	2.5	0.38	0.76	0.81	0.5	0.002
											Σ	0.018
S = 100 · 0.8 · Σ = 100 · 0.8 · 0.0182 = 1.456 cm												

CONCLUSIONS

After the researches, can be formulated the following conclusions:

- Morphologically, the location is relatively plain, good for the foundation, with good stability and are formed: layer of concrete (0,0 to 0,1 m); yellowish brown silty clays, clays, plastic consistent with the average compressibility, having nests of gravel, very wet (0,1 to 3,3/3,5 m); yellow clay powder, plastic consistent with average compressibility, the very wet wipes (3,3/3,5 to 5,0 m).
- The aquifer horizon was not intercepted by the drills, because the water level is less than 23 meters.
- The conventional pressures vary between P_{conv}= 152 kPa, for the foundation depth Df=0.8 m and the foundation width B=1.0 m and P_{conv}= 226 kPa for Df=3 mm and B=3.0 m (table 2).
- The admissible pressures at the limit deformation status (fundamental loading) vary between Ppl=156.7 kPa for Df=0.8 m and B=1.0m and P_{pl}=212.7 kPa, for the foundation depth df=3m and the width of the foundation B=3.0 m (table 3).
- The admissible pressures at the limit status of portent capacity vary from P_{cr}= 224.2 kPa for the foundation depth Df = 0.8 m and the foundation width B=1.0 m and P_{cr}=277.1 kPa for the foundation depth df=3m and the width of the foundation B=3.0 m (table 3).
- The absolute, probable compaction for a rectangular foundation with the B=2.0 m and the foundation depth hf=1.5 m that exerts a pressure Pn=2.0 daN/cmp is S=1.456 cm (table 4).
- It is recommended to foundation beams balancing isolated.
- The last 10 cm of the digging will be made manually during the day when the concrete will be put.
- Regarding the seismicity, the researched surface is located in the D zone with the coefficient ag=0.16, the corner period Tc=1.0 s, the 7 degree (7 degree with a period of return of 50 years).
- Site is part of the first geotechnical study and has a geotechnical risk environment.

- The wind actions classify the location in the zone B.
- The snow actions classify the location in the zone C.
- According to STAS 6054, the freezing depth of the zone is 0.85 m.
- After the digging behavior, the land is classified in the II-nd category of medium.
- Compacting the filling level control will be achieved by STAS 1913/13-83.
- Slopes of the excavation will be tilt least 1/1 or will be supported.

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