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The investigations of interaction of boring piles with soil ground of coastal area of Caspian Sea

Les enquêtes de l'interaction des piles ennuyeux avec le sol du sol de la zone côtière de la mer Caspienne

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ABSTRACT: The Bautino Atash Base is planned to provide marine services to the Caspian Services Group (CSG) fleet of vessels as well as multinational oil and gas companies involved in the offshore oil exploration and production. The Base will be located in Tyub-Karagan Bay on the eastern shore of the Caspian Sea.

In this article loading tests used for deep drilling piles in Bautino near Aktau, Kazakhstan. Bored piles which have diameter 530 mm and 15 m depth have been executed at the Caspian Sea for more cargo shipments platforms construction site. Some of the requirements of the designer of piled foundations and to what extent the accessible testing methods comply with these requirements are considered. Finally, some recommendations are made for testing methods suitable for problematical ground conditions of Kazakhstan are introduced.

Static pile load test is the most reliable method to obtain the load-settlement relation of piles. Most of the static pile load tests are performed using reaction systems. The number of pile load tests in construction site is limited to 2 piles in usual of construction site in Kazakhstan.

The bearing capacity of boring piles according to the results of SLT-1 and SLT-2 amounted to be 1200 kN, settlement 18,08 mm and 11,39 mm.

In Kazakhstan a safety factor of SLT is 1.2. Therefore the design value of the allowable piles capacity, Q_d was estimated to be $Q_d = 1200/1.2 = 1000\text{kN}$.

These investigations are important for understanding of behaviour of piles on problematical soil ground of coastal area Caspian Sea.

1 INTRODUCTION.

Field soil testing with piles on the territory of Kazakhstan and CIS countries is carried out in accordance with the requirements of GOST 5686-94. Static soil testing for bored piles begin after reaching the strength of concrete more than 80% of the project or after the piles rest for driven.

- 3 days - with sandy soils, besides water-saturated fine and silty;

- 6 days - with clay soils and diverse;

In the composition of installation for soil testing with static compression load should include equipment such as:

- device for pile loading(jack);

- Support structure or platform for perception reaction forces (eg, the system beams with anchor piles or cargo platform);

- device for measuring the displacement of the pile during the test (the reference system with measuring instruments);

A device for loading piles must provide coaxial and central transfer loads to the pile, the possibility of transferring loads to feet, the constancy of pressure at each loading step. The distance from the axis, the full-scale pile test to anchor the pile must be at least 3d, but not less than one and a half meters. Instruments for measuring deformation (displacement) of piles (deflectometer) should ensure the measurement accuracy of 0.1 mm. (A.Zh. Zhussupbekov and eg.)The number of devices installed symmetrically at equal (no more than two meters) distance from the pile under test must be at least 2 units. During use of the deflectometer is used a steel wire of 0.3 mm diameter. Before beginning the test wire must be pre-stretched two days with load of at least four kilograms. During the test, the load on the wire should not be more than one and a half kilograms. Range measurement gauges and division value used to determine the load on the pile during the tests, depending on the chosen maximum load on the pile is provided for testing the program, with a margin of at least 20 percent. The loading of test piles produce uniformly without shocks with load steps, which value are established by the test program, but is taken no

more than 1/10 of the programmed maximum load on the pile. At the lower ends of the full-scale burial piles in coarse soils, gravelly and dense sands and clay soils of hard consistency allowed the first three stages of the load is taken equal to 1/5 of the maximum load specified in the program. On each foot loading full-scale pile remove reports from all devices for measuring deformation as follows: zero report - before loading the pile, the first report immediately after application of the load, the field of this series of four reports at intervals of thirty minutes and then every hour until the conditional deformation stabilization (Zhussupbekov A.Zh, Omarov A. R. 2016.).

For criterion conditional deformation stabilization tests of full-scale pile takes speed sediment piles on a given loading level not exceeding 0.1 mm in the last 60 minutes of observation, if at the lower end of the pile lie sandy soil or clay soils from hard consistency to low-plastic consistency, as if under the lower end of the pile lie clay soils from high-plastic to fluid consistency, then two o'clock observation. Test load full-scale pile should be brought to the point where the total sediment pile is not less than forty mm. At the lower ends of the full-scale burial piles in coarse dense sand and clay soils of hard consistency load must be reduced to the value provided by the test program, but not less than one and a half the value of pile carrying capacity determined by calculation or calculated resistance of the pile on the material.

Unloading piles produce stepwise after reaching maximum load equal to twice (in one step) values of the steps of loading each stage delayed at least 15 minutes. Reports for measuring deformation are removed immediately after each stage of discharge and within fifteen minutes of observation. After complete discharge (zero) observations of elastic displacement piles should be done within 30 minutes at the sandy soils lying below the lower end of the pile, and sixty minutes with clay soils. Results of soil test with pile is made in the form of plots of "load - settlement" and strain measurement in time on the steps of loading and unloading.

2 SURVEY OF SOILS BY METHOD OF CPT (CONE PENETRATION TEST)

Field testing of soils by static sounding was executed for more detailed partition of soils and determination of bearing capacity of piles on soils (see Figure 1).

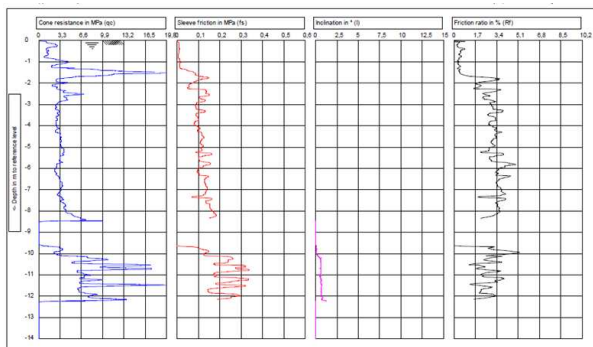


Figure 1. Results of CPT 1.

3 STATIC LOAD TESTS OF BORING PILES

In this article loading tests used for deep drilling piles in Bautino near Aktau, Kazakhstan. Bored piles which have diameter 530 mm and 15 m depth have been executed at the Caspian Sea for more cargo shipments platforms construction site (see Figure 2). Some of the requirements of the designer of piled foundations and to what extent the accessible testing methods comply with these requirements are considered. Finally, some recommendations are made for testing methods suitable for problematical ground conditions of Kazakhstan are introduced (A.Zh. Zhussupbekov, M.K. Syrlybaev, R.E. Lukpanov, A.R. Omarov. 2015.) .



Figure 2. The Caspian Sea for more cargo shipments platforms construction site.

Static pile load test is the most reliable method to obtain the load-settlement relation of piles. Most of the static pile load tests are performed using reaction systems. The number of pile load tests in construction site is limited to 2 piles in usual of construction site in Kazakhstan (see Figure 3).



Figure 3. Support structure or platform for perception reaction forces (the system beams with anchor piles).

Static tests were conducted in accordance with the requirements of GOST 5686-94 "Soils. Methods of the field tests by piles".

On results tests the charts of dependence were got settings of pile from loading and change setting on the stages of loading in time (see Figure 4) (A. Zhussupbekov, A. Omarov. 2016.).

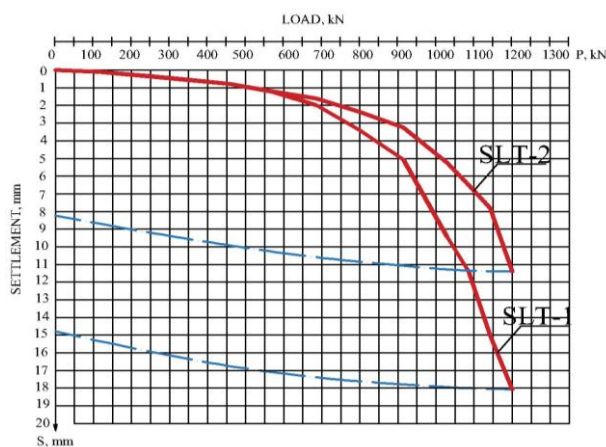


Figure 4. Results of Static load test (SLT).

4 CONCLUSION

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These investigations are important for understanding of behaviour of piles on problematical soil ground of coastal area Caspian Sea.

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