

SUMMARY

of the PhD Thesis on the Specialty 6D072900- «Civil Engineering»

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Work of foundations at influence horizontal and step deformations of the soil bases

Topicality of the research. Over the last 10-15 years there have been some changes in the construction of buildings and structures on undermined territories and also in terms of the effects of mining on surface features. The impact of mining on buildings and structures increased as a multiple undermining of buildings and structures has a different character of stress-strain state in comparison with a single undermining. In large cities increased the number of buildings with residential and public high-rise buildings, including in mining areas. Besides, to a large extent, increased the proportion of buildings with underground areas, however, existing building codes to address all emerging issues is insufficient, especially for sites that have to develop with the shortage of available urban areas.

The construction of buildings and structures on undermined territories was a particular. Buildings constructed in these conditions as a result of underground mining, displacement of soil in mined-out space and formation on the earth's surface of the mould of movement in the process of operation are subjected to uneven subsidence and horizontal and stepped deformations.

The main specific feature that is characteristic of undermining areas in contrast to areas with other soil conditions are the horizontal and the stepped deformations of the earth's surface in the zone of influence of undermining of territory that have an impact on the foundations first and foremost, to their bearing capacity.

Analysis of the results of experimental and theoretical studies will allow to draw a conclusion about the change of foundations work depending on the horizontal and stepped deformations of the earth's surface

The **aim of the research** lies in the study of different types of foundations (single piles, pile groups, slab foundations) under the influence of horizontal and stepped deformations of soil bases.

On defense are present the next **basic scientific positions (results):**

- main influence on the work of foundations on undermined territories has a change of stress-strain state of the soil massif under the influence of horizontal and stepped deformations of the earth's surface arising from undermining work;
- value of settlement that occurs on undermined territories grow with increasing the horizontal and stepped deformations of tensile of the earth's surface;
- methods of testing models of foundations in the experimental (volumetric) stand at the influence of horizontal and stepped deformations on undermining bases;

- practical recommendations for assessing the work of foundations on undermining territories at the influence of the horizontal and stepped deformations.

The object of the research is the work different types of foundations located on undermining base under the influence of horizontal and stepped deformations.

The subject of the research is the foundations of different types, located on undermining soil.

Scientific novelty of the results consists in the following:

- the mechanism of change of work of foundation models on undermined territories depending on the horizontal and stepped deformations;
- experimentally and practically substantiated a significant difference in the different types of foundations on undermining site;
- justified experimentally and practically the use of a particular type of foundation on undermined basis;
- developed test methodology for stand, which can be used to carry out experimental investigations to study the work models of foundations in the conditions of application of the horizontal and stepped deformations;
- developed a method of analysis of the interaction of foundations with soil at the effect of horizontal and stepped deformations in undermining areas.

Research objectives were as follows:

- specify the main causes of risk of construction and, in particular, the device of the foundations on undermined territories;
- to carry out model tests on the influence of horizontal and stepped deformations of the soil basis at the foundation models;
- to conduct numerical simulation of the influence of the horizontal and stepped deformations on the work of the foundation, to give a comparison of the results obtained;
- to analyze the compare the performance of different types of foundations under horizontal and stepped deformations of the soil basis;
- to estimate the sizes of the regions of distribution of stresses in soil basis, using the results of experimental studies in terms of the horizontal and stepped deformations;
- to explore the behavior of model foundations on undermining territories;
- to develop methodical recommendations for the study of foundations work with different variants of the deformation of the soil mass.

Research methods. For the solution of the tasks needed to conduct the complex theoretical and laboratory studies, as well as the processing results of the object study.

The reliability of scientific statements is confirmed by the correct formulation of the objectives of the study, informed of laboratory results and numerical modeling results, a satisfactory convergence of numerical laboratory data (in the range 4-14%).

Practical significance of the research outcomes consists that the developed technique of the forecast of work of foundations on undermined

territories allows evaluating the behavior of foundations under the effect of horizontal and stepped deformations of the soil massif and to compare the character of change of work of the various types of foundations.

Personal contribution of the applicant is that first presented the mechanism for changes of work of models of foundations on undermining territories under the influence of horizontal and stepped deformations and experimentally justified and practically significant difference in the different types of foundations on territory of undermined working.

Approbation of the research results. The main results of the research on the dissertation work were reported and discussed at:

- International Scientific- practical Conference «Innovations in the Field of Construction of Transport Facilities: Formation, Problems, Prospects» (KSUSTA, Bishkek, Kyrgyzstan, March, 2016);
- International Scientific-practical Conference «Science, Technical Regulation and Engineering in Construction: Condition, Prospects» (KarGTU, Karaganda, Kazakhstan, April, 2016);
- 8th Asian Young Geotechnical Engineers Conference «Challenges and Innovations in Geotechnics» (L.N. Gumilyov ENU, Astana, Kazakhstan, August, 2016);
- All-Russian Scientific-technical Conference «Engineering and Geotechnical Surveys, Design and Construction of Bases, Foundations and Underground Structures" (SPbGASU, St. Petersburg, Russia, February, 2017), where the author presented a scientific reports.

Publications. The main provisions and results of research work were published in 14 scientific papers.

Of these, 5 articles recommended by Committee on Control in Education and Science of Ministry of Education and Science of the Republic of Kazakhstan:

1. Турашев А.С., Лукпанов Р.Е., Омаров А.Р., Жукенова Г.А. Method Statement for Low Strain Pile Integrity Testing. Научный журнал «Вестник», Евразийского национального университета им. Л.Н. Гумилева, ISSN 1028–9364, №6 (109), 2015. – Том 1 - С. 238–243.

2. Турашев А.С., Лукпанов Р.Е., Омаров А.Р., Жукенова Г.А., Танырбергенова Г.К. The Applications of Dynamic (PDA and Traditional) and Traditional Static Piling Tests of Astana City. Научный журнал «Вестник», Евразийского национального университета им. Л.Н. Гумилева, ISSN 1028–9364, №6 (109), 2015. - Том 1 - С. 244–249.

3. Жусупбеков А.Ж., Лукпанов Р.Е., Омаров А.Р., Жукенова Г.А., Танырбергенова Г.К. Опыт применения методов SCQLT и O-Cell для испытания свай в грунтовых условиях г. Астаны. Научный журнал «Вестник» Кыргызского государственного университета строительства, транспорта и архитектуры, ISSN 1694–5298, №1 (51), февраль, 2016 г. - С. 386–392.

4. Жусупбеков А.Ж., Омаров А.Р., Лукпанов Р.Е., Жукенова Г.А., Танырбергенова Г.К. Анализ влияния забивки свай на существующий фундамент (вибромониторинг). Научный журнал «Вестник» Пермского

национального исследовательского политехнического университета. Строительство и архитектура, DOI:10.15593/2224-9826/2016.1.08, №1, март, 2016 г. – Том 7 - С. 131-138.

5. Жусупбеков А.Ж., Калданова Б.О., Жуконова Г.А. Консолидированно-недренированные испытания грунтов в приборе трехосного сжатия. Научный журнал «Вестник», Евразийского национального университета им. Л.Н. Гумилева, ISSN 1028–9364, №2 (111), 2016. - Том 1 - С. 205–210.

2 articles published in the proceedings of International Conferences having impact factor:

6. Zhussupbekov A.Zh, Kaldanova B.O., Zhukonova G.A., Muzdybayev Y., Muzdybayeva T., Dosmukhametova B. Research of the mechanical properties of soil basis an equivalent material.//Proceeding of the 8th Asian young geotechnical engineers conference «Challenges and Innovations in Geotechnics», 2016, p.61-64

7. Zhussupbekov A.Zh, Tulegulov A.D., Omarov A.R., Zhukonova G.A., Tanyrbergenova G.K.. The analysis of the piling tests on construction site “The future of the free country”.//Proceeding of the 8th Asian young geotechnical engineers conference «Challenges and Innovations in Geotechnics», 2016, p.127-130.

6 articles published in the proceedings of International Conferences:

8. Zhussupbekov A.Zh., Omarov A.R., Zhukonova G.A. The experience in applying of static load and O-cell pile testing geotechnologies in problematical soil conditions. // International Mini Symposium, Chubu, 2016, p.44.

9. Zhukonova G.A., Kaldanova B.O. Program of model tests of piles work under horizontal deformations. //Proceeding of the International scientific-practical conference «Science, technical regulation and engineering in construction: condition, prospects», 2016, P.265-267.

10. Zhussupbekov A.Zh., Omarov A.R., Zhukonova G.A., Tanyrbergenova G.K. Geotechnical infrastructures of new capital Astana on problematical soil ground. //Proceedings of the 17th Nordic Geotechnical Meeting, NGM 2016, Reykjavik, p. 923-930 Сборник трудов международной научно–практической конференции «Современные геотехнологии в строительстве и их научно–техническое сопровождение», посвященной 80–летию образования кафедры Геотехники СПбГАСУ (механики грунтов, оснований и фундаментов ЛИСИ). Часть 1,

11. Zhussupbekov A.Zh., Tanaka T., Aldungarova A.K., Zhukonova G.A., Sabirova A. Natural and man-made disasters in Kazakhstan. Proceeding of the International scientific and technical conference «Structural’s strength, seismodynamics of buildings and constructions», 12-14 September, 2016, Tashkent, P.29-37.

12. Zhussupbekov A.Zh., Omarov A.R., Zhukonova G.A. The case study of testing of piles on construction site «EXPO-2017». Proceeding of the 14th International Conference «New Challenges in Geotechnical Engineering», ISBN: 978-969-8442-09-5, January 23, 2017, p.89-94

13. Zhussupbekov A.Zh., Omarov A.R., Zhukonova G.A., Ahazhanov

S.B., Tanyrbergenova G.K. The complex of piling tests on New Railway Station construction sites in Astana. Сборник научных трудов Всероссийской научно-технической конференции «Инженерно-геотехнические изыскания, проектирование и строительство оснований, фундаментов и подземных сооружений», Санкт-Петербургский государственный архитектурно-строительный университет, ISBN 978-5-9227-06794-7, январь, 2017, Санкт-Петербург, Россия. - С. 155-160.

1 article published in the proceedings of National Conferences:

14. Жукенова Г.А. Программа модельных испытаний работы сваи при горизонтальных деформациях. Сборник материалов Международной научной конференции «Наука и образование-2015», 2015, С.6551-6554

Volume and structure of the thesis. The thesis consists of introduction, five chapters, the conclusions and list of the references. The thesis is stated on 135 pages of the computer text, contains 96 drawings and 16 tables.