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ASSESSMENT OF INTERACTION THE NEW CONSTRUCTION OBJECT AT FULL LOAD AND THE SURROUNDING BUILDING IN THE DENSE URBAN DEVELOPMENT CONDITIONS

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Construction in densely built-up conditions creates in each case a set of additional risks that must be taken into account when developing design and design-technology documentation, organizing construction, and further safe operation of objects. The work is devoted to research the impact of a new building at full load after completion of its construction has been investigated through an assessment of the interaction with the building envelope, the ground mass of the base and the foundation of the existing five-story building, in comparison with the assessment of the impact of a deep excavation in the process of engineering preparation for this construction, based on the developed methodology for studying the interaction of new construction objects and nearby buildings in complex engineering and geological conditions and dense development conditions.

For numerical studies of the stability of the combined space, the proposed methodology has been used, which is built on the initial relations of the variational equations of equilibrium and the equation of the load surface in the six-dimensional stress space, which is a development of the theory of the limit stress state of the soil half-space based on the introduction of an extended yield criterion for a plane problem of the nonlinear theory of elasticity and plasticity, which provides for the determination of the value of the second critical load, at which solid sections of the ultimate stress state appear in the soil half-space.

From the analysis of the movements of the nodes located on the vertical face of the «wall in the soil» structure (retaining wall of the pit), it can be concluded that the transverse displacements of the retaining wall compared to the calculations according to the first option have changed to the opposite, which is associated with the formation of a sliding prism under the passive pressure on the retaining wall from the side of the pile foundation of the new building. This indicates a change in the stress-deformation state of the soil base of the existing building, from the influence of the deep excavation during the construction process, which was evaluated according to the first version of calculations, to the impact of the new building after the end of construction, which was analyzed according to the second version of calculations. In this way, the change in the stress-deformation state of the main urban building is determined, which is a criterion for determining the impact of adjacent construction in the urban area on the condition of the ground bases and foundations of adjacent buildings, their preservation and ensuring safe operation.

Keywords: dense building, new construction, combined half-space, stress-strain state, stability parameters, enclosing structures.

Introduction. During construction in densely populated areas, one of the main issues is ensuring the preservation of existing adjacent buildings located in the influence zone of deep pits excavation. One of the most important factors determining the quality condition of industrial, civil and transport construction objects is the strength and absence of cracks and local destruction in the structures of buildings and structures during the entire period of operation.

Recently, construction in the cities of Ukraine has been carried out in densely built-up conditions in difficult geological conditions with maximum

use of underground space for arranging underground parts of construction objects. At the same time, such construction is carried out within built-up areas, which affects the stability of adjacent areas, and changes their regime and causes significant changes in the stress-deformed state of buildings and structures of adjacent buildings.

Formulation of the problem. Construction in densely built-up conditions creates in each case a set of additional risks that must be taken into account when developing design and design-technology documentation, organizing construction, and further safe operation of objects.

For adjacent objects of existing buildings, construction may create a risk of damage, disruption of normal operation, deformation of structures, and sometimes accidents due to disturbance of foundation soils when performing nearby earthworks for the development of deep pits; compaction and movement of the soil in the active zone of the foundations due to additional loads from the new building, dynamic loads on the foundation from the installation of enclosing structures of deep pits with the use of sheet piles, piles and anchors; destructive processes - erosion, landslides, karst-sufosis phenomena, freezing, subsidence of the earth's surface, changes in established hydrogeological conditions and associated flooding or drainage of built-up areas; vibrational or dynamic effects from the operation of construction equipment; and, in addition, violation of normal conditions of insolation, ventilation, engineering support, landscaping of existing buildings [3].

During the design of construction objects in densely built-up conditions, a complex of measures to ensure construction safety is necessary, with further monitoring, which involves on-site observations of the technical condition of the construction object, adjacent buildings, the engineering, geological and ecological situation in the adjacent territory, and a stabilization period facility operation [7]. The specified set of measures provides for engineering searches of the construction site in densely built-up conditions for the development of project solutions and construction methods of the object, which ensure the preservation of the operational qualities of the adjacent objects and compliance with man-made safety requirements. At the same time, it is necessary to choose volume-planning and structural solutions taking into account the influence of deep pits and buried structures on existing buildings and structures and to provide enclosing structures for holding the walls of the pit [3], a the arrangement of the foundations of a new object is designed taking into account their influence on the stress state of the foundations of existing objects and ensuring the possibility of their independent settlement.

The analysis of recent studies and publications, in which the solution to this problem has been initiated, gives reason to believe that the strength of buildings and structures depends on the characteristics of the strength of the soil foundation and the complex of reasons and factors that can influence their change. Soils, as a rule, are complex dispersed systems, the physical and mechanical characteristics of which can change under the influence of various reasons and factors.

One of the determining factors affecting the structural scheme of the fortification structures, the cost-effectiveness of the adopted design decisions,

are the magnitudes of soil deformations in the foundations of structures located nearby. The complexity of the processes and a significant number of factors that arise in the natural basis during the installation of fortifications, their changes over time, etc. calculations do not take into account enough. Deformations of enclosing structures, phenomena of suffusion, evaporation, disturbance of stability, etc. lead to a change in the structure and a decrease in the mechanical strength of soils, filtration deformations and deformations of the earth's surface, are one of the main factors that cause accidental destruction of structures of buildings and structures [2].

In pit fence structures, one of the determining factors affecting their structural scheme and the cost-effectiveness of the project decisions is the horizontal pressure of the soil on the fence, the magnitude of soil deformations in the foundations of structures located near the boundary of the pit, which today for complex engineering geological conditions are insufficiently studied.

The aim of the work and research tasks is assessment the impact of a new building at full load after completion of its construction has benn investigated through an assessment of the interaction with the building envelope, the ground mass of the base and the foundation of the existing five-story building, in comparison with the assessment of the impact of a deep excavation in the process of engineering preparation for this construction, based on the developed methodology for studying the interaction of new construction objects and nearby buildings in complex engineering and geological conditions and dense development conditions.

Theoretical foundations of research. For numerical studies of the stability of the combined space, the proposed methodology has been used, which is built on the initial relations of the variational equations of equilibrium and the equation of the load surface in the six-dimensional stress space, which is a development of the theory of the limit stress state of the soil half-space based on the introduction of an extended yield criterion for a plane problem of the nonlinear theory of elasticity and plasticity, which provides for the determination of the value of the second critical load, at which solid sections of the ultimate stress state appear in the soil half-space [1].

The developed theory is built on the ideas of generalizing the dependences of soil mechanics and consists in constructing the relations of the stress-strain state of the calculation domain from the standpoint of the mechanics of a deformed solid body, using algorithms for solving problems of the theory of elasticity and plasticity, with the construction of universal calculation models of the combined half-space, which allows more to reasonably determine the value of the stress-deformed state of complex soil foundations that are in interaction with the enclosing structures of fortifications, foundations of adjacent buildings and the entire complex of buildings in the surrounding buildings. On the basis of this, a methodology was developed for the study of the interaction of enclosing protective structures with the soil half-space in the above-limit state, taking into account geometric and physical nonlinearities in the formulation of the task, during the implementation of the evolution of complex loading, taking into account the active and passive components of the

load and the unloading effect of the combined half-space, which provides more accurate consideration of both elastic and plastic deformations, and allows for a more reasonable determination of the stress-strain state of bases and foundations, building structures and surrounding buildings, which are in interaction with complex soil bases, that is, it allows to investigate the processes that occur in the soil foundations during the reconstruction of urban areas, which essentially constitute an assessment of the impact of new construction on the adjacent buildings, especially in difficult engineering and geological conditions [6].

Assessment of the interaction of new construction object at full load and surrounding buildings. In order to determine the impact on existing buildings during the reconstruction of a part of the city territory in densely built-up conditions, as part of the scientific and technical support for the design and construction of a 25-story residential building with built-in and attached office premises and underground parking, design and calculation studies were carried out with numerical calculations of the impact to a half-space to a depth of 41.0 m in the central cross-section of the investigated site with a length of 150.0 m, as well as to the adjacent buildings after the completion of construction at full load (Fig. 1).

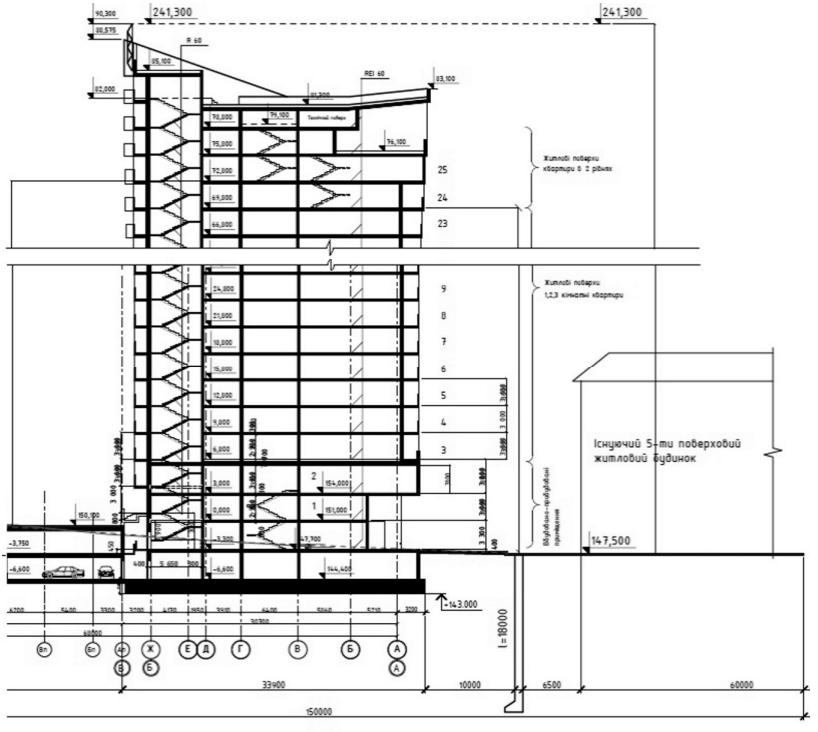

Fig. 1. Section of the designed 25-story residential building and the existing 5-story residential building

In the conducted numerical studies, the methodology for solving the problem of nonlinear soil mechanics based on the limit equilibrium of soil massifs in interaction with the enclosing structures of deep pits and foundation elements of new and existing buildings is applied. The results of the study of the combined half-space using a new model of the equations of state of a multi-layered soil massif for a specific problem in the variant of the interaction of the enclosing structure of the pit with the soil half-space and the foundations and the base of the existing residential five-story building, when the active pressure on the supporting «wall in the soil» exceeds passive pressure of soil resistance at the base of the pit under the building being designed.

The purpose of the research is to determine the change in pressure on the enclosing structure over time and to determine the change in the stress-strain state of the enclosing structure itself and the foundation of the existing residential building. The result of determining the change in the deformation of the base of a 5-story building is the fluctuation of the soil base and the maximum amplitude of uneven settlement of the existing building foundations, which is a criterion for determining the influence of adjacent construction in conditions of dense urban development on the condition of the ground bases and foundations of adjacent buildings.

In the conducted numerical studies, the developed methodology for solving the problem of nonlinear soil mechanics based on the limit equilibrium of soil massifs in interaction with the enclosing structures of deep pits and foundation elements of new and existing buildings has been applied. The specified methodology for numerical studies of a heterogeneous half-space is built on the basis of the nonlinear theory of elasticity and plasticity, considering geometric and physical nonlinearities in the formulation of the problem. The results of the combined half-space research using a new model of the state equations of the multilayer soil massif for a specific problem has been obtained in two versions:

1. Assessment of the influence of a deep pit in the process of engineering preparation of construction, through researching the interaction of the enclosing structure of the pit with the soil half-space and the foundations and foundation of the existing residential five-story building, when the active pressure on the supporting "wall in the soil" exceeds the passive pressure of the soil resistance at the base of the pit under the building being designed; which was discussed in the article [8].

2. Assessment of the impact of a new building at full load after construction, through researching the interaction of the enclosing structure and the pile foundation with the grid with the soil mass and the foundation and foundation of the existing five-story building, when the passive pressure exceeds the primary active pressure from the existing building and performs the function of active pressure.

The purpose of the second variant of research is to determine the change in pressure on the enclosing structure over time and to determine the change in the stress-strain state of the enclosing structure itself and the foundation of the existing residential building. The result of the determination is a change in the

deformation of the ground bases of a 5-story building, as well as fluctuations of the soil base and the maximum amplitude of uneven settlement of the foundations of the existing building, that is a criterion for determining the impact of adjacent new construction on the state of ground bases and foundations of nearby buildings in conditions of dense urban development.

The initial data were the determined physical and mechanical characteristics of the soil half-space layers according to the data of engineering geological investigations, considering the correction of the properties of the soils of the multilayer half-space by depth [4], as well as physical and mechanical characteristics of inclusions in the half-space of concrete and reinforced concrete elements, including piles of enclosing structures such as a solid «wall in the soil».

The calculated load per 1 m2 of the pile grillage surface area has been determined, which consisted 82.32 kN/m^2. The resulting load on the foundations edge of the existing 5-story residential building was 14.22 kN on 0.5 m of the outer wall length.

A discrete model and calculation diagram of the interaction of the enclosing structures of the pit, the pile foundations of the new residential building and the foundations of the existing adjacent building with the soil half-space has been built.

The initial variation of the motion equation in accordance with energy methods describes the equilibrium of the elementary volume of an arbitrary continuous medium, regardless of its physical and mechanical properties. The proposed methodology implements the applied approach of variational principles and the theory of finite stress deformed body, when the obtained solutions are related to the distribution of initially elastic regions into elastic and inelastic regions with developed zones of elastic-plastic regions (shearing for soils) of deformations. The initial finite-element model in the process of deformation was transformed in accordance with the criterion of fluidity (destruction) of the soil massif and was divided into two zones for determining the stress-strain state: elastic and elastic-plastic using the loading surface according to the Coulomb–Mohr criterion, considering the tensor-deviator invariant stress functions through the Lode–Nadai invariant [1]. Also, the proposed methodology was used an extended modified Mises yield criterion, which makes it possible to obtain more accurate solutions to stability problems of a combined multilayer half-space.

The discrete model and calculation scheme of the multi-layered soil half-space is built taking into account the presence of inclusions of pit fence structures, new building foundations, existing structures and cavities.

The grid area of the discrete model S_1, S_2, S_3, is regular and placed within the bounds $S_1 = 1$, $M1$, $S_2 = 1$, $M2$, $S_3 = 1$, $M3$. The values of the dimensions of the mesh area were equal:

$$S_1 = M1 = 2,\ S_2 = M2 = 25,\ S_3 = M3 = 104.$$

Thus, the number of nodes of the two-layer mesh area was equal:

$$N_{UX} = M1 \cdot M2 \cdot M3 = 2 \cdot 25 \cdot 104 = 5200.$$

Accordingly, the number of nonlinear equations makes up a system of:

$$K = 3 \cdot N_{UX} = 3 \cdot 5200 = 15600$$

equations without considering the imposed boundary conditions.

The geometric overall dimensions of the calculated half-space were: 41×150 m , the thickness of the half-space was 50 cm.

Results of numerical studies of the discrete model of the combined half-space. The adopted version for calculating the interaction of the enclosing structures and the existing building foundations with the soil half-space with a free pit is a classic solution to this problem and, as a rule, the most dangerous from the point of view of the pit slope stability.

For the purpose of comparison with the impact of a deep pit in the process of engineering construction preparation, by researching the interaction of the pit enclosure structure with the soil half-space and the foundations and foundation of the existing residential five-story building, a research of the impact of the new building at full load after construction has been carried out, by investigating the interaction of the enclosing structure and the grid pile foundation with the soil mass and the ground bases and foundation of the existing five-story building. For this purpose, the interaction of the enclosing structures, the pile foundations of the new building and the foundations of the existing residential building with the soil half-space at full load has been considered.

Based on the obtained numerical results, the stress-strain state of the «wall in the soil» structure under full loading of the half-space has been determined, which is illustrated by the diagram of transverse deflections (Fig. 2) and by the diagram of bending moments in the «wall in the soil» section (Fig. 3).

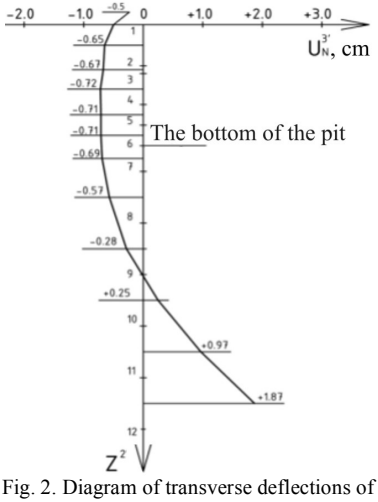

Fig. 2. Diagram of transverse deflections of the «wall in the soil» at full loading of the half-space

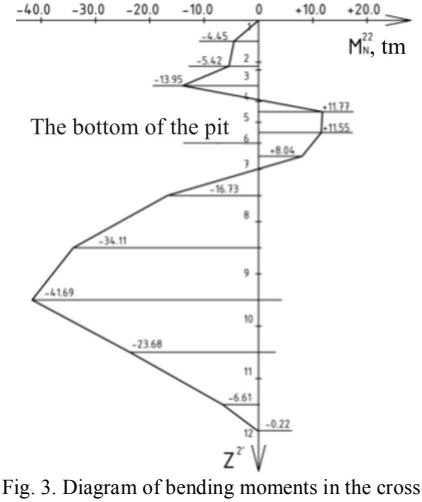

Fig. 3. Diagram of bending moments in the cross-section of the «wall in the soil» structure with full loading of the half-space

According to the second version, the settlement of the foundations of the existing building in the center along the length did not change at all, that is, it was in the first version U^2_{4459}=26.17cm, and in the second version it became U'^2_{4459}=26.09cm, that is, the difference of everything U^2_{4459}–U'^2_{4459}=0.8 cm.

But the average rotation of the sole has changed on the opposite: first to $+\tan\alpha=0.0021$, second to $-\tan\alpha=0.0022$, due to the fact that the prism was formed by passive pressure on the retaining wall from the side of the pile foundation of the new building.

From the analysis of the movements of nodes located on the vertical face of the «wall in the soil» structure (retaining wall of the pit), it was concluded that the transverse displacements of the retaining wall occur by rotating it as a significant whole clockwise. With such a turn, the internal forces were insignificant within 50% of the strength margin of the retaining wall.

The analysis of the pile foundation settlement indicated a smooth and symmetrical appearance with a maximum settlement up to 42.28 cm, with a strut ±2.48 (2.34) cm. This settlement is calculated with a reliability coefficient equal to $Kh=1.4$, that is, subsidence in reality can be almost two times less. But it was the unevenness of the subsidence, which was only 6.7 cm at half run, that is dangerous – 17 m, namely:

$$\frac{6,7}{1700} \cong 0,0038 < 0,0044.$$

At the same time, the roll was formed by only 0.5 cm:

$$\frac{0,5}{3400} \cong 0,00014 < 0,001.$$

The analysis of the cross-section diagrams of the retaining wall proved that they are almost the opposite of the first version, while the bending moment increased to 41.69 tm and almost lost the margin of strength that was in the first version.

From the analysis of the movements of the nodes located on the vertical face of the «wall in the soil» structure (retaining wall of the pit), it can be concluded that the transverse displacements of the retaining wall compared to the calculations according to the first option have changed to the opposite, which is associated with the formation of a sliding prism under the passive pressure on the retaining wall from the side of the pile foundation of the new building. This indicates a change in the stress-deformation state of the soil base of the existing building, from the influence of the deep excavation during the construction process, which was evaluated according to the first version of calculations, to the impact of the new building after the end of construction, which was analyzed according to the second version of calculations. In this way, the change in the stress-deformation state of the main urban building is determined, which is a criterion for determining the impact of adjacent construction in the urban area on the condition of the ground bases and foundations of adjacent buildings, their preservation and ensuring safe operation.

General conclusions and recommendations. The problem of changing the pressure on the enclosing structure in time and determining the change in the stress-strain state of the enclosing structure itself and the foundation of the existing residential building has been solved. The change in the deformation of the foundation of a five-story building, that is, the fluctuation of the soil base and the maximum amplitude of uneven settlement of the foundations of the existing building, which is the criterion for determining the impact of adjacent

construction in the urban area on the condition of the ground bases and foundations of adjacent buildings, has been determined.

The results of scientific research proved that, according to the results of the first version of numerical calculations, it is enough to design a protective screen of enclosing structures to a depth of 10-12 m, but according to the results of the second option, in the presence of fluctuations of active and passive pressure on the enclosing «wall in the soil», it is necessary to design a screen to a depth of 17.0 m, at the same time, the maximum amplitude of uneven precipitation almost approaches the maximum relative normative value.

The impact of the new building on the existing nearby building of a five-story residential building turned out to be quite significant. There is a change in the pressure on the protective enclosing structure, which causes the maximum allowable subsidence of the sole of the foundations and a change in slopes.

The amount of subsidence will not cause the development of cracks, but the protective screen – the enclosing structure within the connection with this building must be arranged to a depth of at least 17.0 m, and a diameter of at least 600 mm, with the arrangement of appropriate subsidence joints.

The developed recommendations are taken into account in the production activity when making design decisions, taking into account the possible dangers from the impact of the construction of a 25-story residential building to justify the necessary engineering training measures to ensure the safe operation of the existing buildings and the protection of the territories.

The applied calculation methodology allows to consider the nature of the inhomogeneities of soil bases during the construction and reconstruction of buildings and to determine the influence of inclusions of soil elements of different strength on the elastic-deformed state of structures interacting with the soil base in complex geological conditions and especially in conditions of close adjacent buildings. On the basis of the conducted research, explanations were made regarding the situation at this facility, and recommendations were developed on the influence of heterogeneous soil foundations on the stress-deformation state of pit fences, ground bases and foundations of adjacent buildings, which were used in the reconstruction and development of certain areas in the city of Kyiv and other cities of Ukraine.

Thus, the methodology for determining the stress-deformation state of fences of deep pits, bases and foundations, and structures of buildings and structures located near pits, in the presence of inhomogeneities and weak layers in the base and the development of evaporation or suffusion of soils, allows to substantiate the assessment of the influence of buried structures on adjacent development of populated areas, ensure safe construction and reduce the risks of negative impact during construction in conditions of dense construction.

In order to find out the possible scope of reconstruction, it is necessary to carry out a comprehensive study of the degree of influence of new construction on the state of the foundations of adjacent existing buildings, for which it is necessary to solve complex scientific problems related to the methods of mechanics of a continuous environment in the most general approach based on the proposed methodology of scientific technical substantiation of the

reconstruction of urban areas. The solution of this complex problem from a reliable analysis is connected with the research of the combined space, namely the interaction of solid deformed bodies with soil massifs, based on the laws of the nonlinear theory of elasticity and plasticity, nonlinear soil mechanics, variational methods, with the connection of the apparatus of nonlinear programming and effective numerical methods [5].

The design and construction of buildings and structures in areas with dense urban development with complex engineering and geological conditions is associated with the need to solve complex geotechnical problems in order to ensure normal operating conditions for newly constructed and existing buildings and structures, and to prevent emergency situations. In the case of a complex engineering and geological situation, it is necessary to develop appropriate measures to strengthen the ground foundations and protect the territories. It is also necessary to further develop normative documentation that regulates the implementation of the main technological processes of construction and assembly works and takes into account the current situation of construction in the conditions of dense urban development, its impact on existing nearby buildings, which would include a special section on scientific substantiation and scientific and technical support reconstruction. The entire complex of the specified measures during the implementation of works in the process of reconstruction of territories with dense urban development and complex engineering and geological conditions should be included in the development of district planning projects and schemes with justification of the appropriate scale of reconstruction.

The developed recommendations can be taken into account when making design decisions, taking into account possible dangers from the impact of a new multi-story building for the scientific justification of the necessary measures of engineering preparation of a new building [7]. In the future, the proposed methodology for the scientific substantiation of measures for the engineering preparation of territories and forecasting their possible consequences, based on the analysis of numerical studies of the stressed state and the assessment of the stability of the foundations of real objects according to the generalized design parameters, will allow to build the principles of reconstruction of urban areas with dense buildings and complex geological conditions and provide appropriate recommendations for determining the impact of reconstruction and the scale of necessary engineering preparation in order to protect the territories and preserve the existing buildings.

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ОЦІНКА ВЗАЄМОДІЇО Б'ЄКТУ НОВОГО БУДІВНИЦТВА ПРИ ПОВНОМУ НАВАНТАЖЕННІ ТА ПРИЛЕГЛИХ БУДІВЕЛЬ В УМОВАХ ЩІЛЬНОЇ ЗАБУДОВИ

У роботі досліджується вплив нової будівлі при повному навантаженні після закінчення будівництва, шляхом оцінки її взаємодії з огороджувальними конструкціями з ґрунтовою масою та основою і фундаментом існуючої п’ятиповерхової будівлі, у порівнянні з оцінкою впливу глибокого котловану в процесі інженерної підготовки будівництва, на основі розробленої методології дослідження взаємодії об'єктів нового будівництва та прилеглої забудови у складних інженерно-геологічних умовах і в умовах щільної забудови.

Для чисельних досліджень стійкості комбінованого простору використовуються запропонована методологія, яка побудована на вихідних співвідношеннях варіаційних рівнянь рівноваги і рівняння поверхнінавантаження у шестивимірномупросторінапружень, що є розвиткомтеорії граничного напруженого стану ґрунтового півпростору на основі запровадження розширеного критерію текучості для плоскої задачі нелінійної теорії пружності і пластичності, яка передбачає визначення величини другого критичного навантаження, при якому у ґрунтовому півпросторі виникають суцільні ділянки граничного напруженого стану.

З аналізу переміщень вузлів, які розташовані на вертикальній грані конструкції «стіни в ґрунті» (підпірної стінки котловану) зроблений висновок, що поперечні зміщення підпірної стіни, порівняно з розрахунками за першим варіантом, змінилися на протилежні, що пов'язано з утворенням призми ковзання за пасивним тиском на підпірну стінку з боку пальового фундаменту новобудови. Це свідчить про зміну напружено-деформованого стану ґрунтової основи існуючої забудови, від впливу глибокого котловану у процесі будівництва, який був оцінений за першим варіантом розрахунків, до впливу нової будівлі після закінчення будівництва, що було проаналізовано за другим варіантом розрахунків. Таким чином визначена зміна напружено-деформованого стану основ міської забудови, що є критерієм визначення впливу суміжного будівництва у міській зоні на стан основ і фундаментів суміжних будівель, їх збереження та забезпечення безпечної експлуатації.

Ключові слова: тісна забудова, нове будівництво, комбінований півпростір, напружено-деформований стан, параметри стійкості, огороджувальні конструкції.

Prusov D.E.

ASSESSMENT OF INTERACTION THE NEW CONSTRUCTION OBJECT AT FULL LOAD AND THE SURROUNDING BUILDING IN THE DENSE URBAN DEVELOPMENT CONDITIONS

The work is devoted to research the impact of a new building at full load after completion of its construction has been investigated through an assessment of the interaction with the building envelope, the ground mass of the base and the foundation of the existing five-story building, in

comparison with the assessment of the impact of a deep excavation in the process of engineering preparation for this construction, based on the developed methodology for studying the interaction of new construction objects and nearby buildings in complex engineering and geological conditions and dense development conditions.

For numerical studies of the stability of the combined space, the proposed methodology has been used, which is built on the initial relations of the variational equations of equilibrium and the equation of the load surface in the six-dimensional stress space, which is a development of the theory of the limit stress state of the soil half-space based on the introduction of an extended yield criterion for a plane problem of the nonlinear theory of elasticity and plasticity, which provides for the determination of the value of the second critical load, at which solid sections of the ultimate stress state appear in the soil half-space.

From the analysis of the movements of the nodes located on the vertical face of the «wall in the soil» structure (retaining wall of the pit), it can be concluded that the transverse displacements of the retaining wall compared to the calculations according to the first option have changed to the opposite, which is associated with the formation of a sliding prism under the passive pressure on the retaining wall from the side of the pile foundation of the new building. This indicates a change in the stress-deformation state of the soil base of the existing building, from the influence of the deep excavation during the construction process, which was evaluated according to the first version of calculations, to the impact of the new building after the end of construction, which was analyzed according to the second version of calculations. In this way, the change in the stress-deformation state of the main urban building is determined, which is a criterion for determining the impact of adjacent construction in the urban area on the condition of the ground bases and foundations of adjacent buildings, their preservation and ensuring safe operation.

Keywords: dense building, new construction, combined half-space, stress-strain state, stability parameters, enclosing structures.

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Досліджується вплив нової будівлі при повному навантаженні після закінчення її будівництва шляхом оцінки взаємодії з огороджувальними конструкціями, ґрунтовою масою основи та фундаментом існуючої п'ятиповерхової будівлі, порівняно з оцінкою впливу глибокого котловану в процесі інженерної підготовки цього будівництва, на основі розробленої методології дослідження взаємодії об'єктів нового будівництва та прилеглої забудови у складних інженерно-геологічних умовах та в умовах щільної забудови.
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The impact of a new building at full load after completion of its construction has benn investigated through an assessment of the interaction with the building envelope, the ground mass of the base and the foundation of the existing five-story building, in comparison with the assessment of the impact of a deep excavation in the process of engineering preparation for this construction, based on the developed methodology for studying the interaction of new construction objects and nearby buildings in complex engineering and geological conditions and dense development conditions.
Fig. 3. Ref. 8.

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