

POORLY EXECUTED BACKFILL ON SUBSIDENT SOILS AS A REASON FOR AN INCREASED RISK OF SURFACE DEFORMATIONS

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ABSTRACT

In urban conditions, engineering and geological processes associated with human economic activity are particularly dangerous factors affecting the development of urban construction. The article considers the subsidence of the surface in the range from the intersection of A. Donish Avenue with the street. Yunus ota to the intersection of Khiebon Street, located at the address Tashkent A. Donisha Avenue, the negative impact of improperly arranged backfill on the construction of the underground structure of the Yunusabad line metro. The study of these processes affecting the development of urban infrastructure should become the basis for long-term planning, development and implementation of targeted urban socio-economic development programs. Analysis of the research results found that the process of subsidence of surfaces along Akhmat Donish Avenue are the result of surface water, water leakage from underground utilities. The main sources of formation: -loss of strength of backfill soils during water saturation; -increase of dynamic loads on the surface of areas with backfill soils; -trenches and pits developed in loess and loess-like soils, at intersections with existing roads and other territories with road surfaces, should be filled to the full depth using sandy, pebble soil, gravel screening or other similar materials that are slightly compressible with a deformation modulus of 20 MPa or more.

Keywords: *Underground Structure, Subsidence, Microdistricting, Engineering and Geological Research, Soil Conditions, Urban Infrastructure, Backfill, Surface Subsidence, Loess, Loess-Like Soils, Dynamic Loads*

INTRODUCTION. The trends of modern construction do not select territories for urban development. In our case, the construction of an underground construction of a metro line in subsident loess and loess-like soils, including on difficult ground conditions and terrain, innovative materials and effective design solutions are used in the construction of buildings and structures. The consequence of these trends was that during the development of urban space or during reconstruction, it becomes necessary to erect structures on dirt slopes, slopes, embankments or in the immediate development of deep pits for the construction of an open metro line. The loss of stability of the slope soil or in the body of an earthen structure caused by a violation of the integrity of the massif can cause serious consequences and even geotechnical disasters. Keeping the slope soils in balance is possible with the help of special structures – retaining walls, which is a labor- and material-costly solution. Therefore, studying the issues of increasing the stability of backfill soil arrays to reduce active pressure on enclosing structures is an urgent task. And the assessment of engineering and geological conditions occurs only at the stage of the technical project, when conducting detailed engineering and geological surveys to substantiate the construction project. It should be noted that underestimation of processes and phenomena related to both geological and climatic and economic human activity leads to negative consequences. In this regard, we have set a goal to study the processes and phenomena associated with backfilling trenches, pits in urban areas.

MATERIALS AND METHODS

In solving this goal, the results of engineering-geological studies on seismic microdistricting of the territory of Tashkent (G.A.Mavlyanov *et al.*,) were used. As well as the methodologies developed by E.M. Sergeev, G.A. Mavlyanov, V.I. Krieger, V.T. Trafimov, A.M. Khudoibergenov S.M. Kasymov, V.A. Ismailov and others used in the practice of engineering-geological studies of urban areas, including field, regime observations, laboratory work and desk research.

As is known, construction on subsident soils, in addition to this, high-quality backfill is one of the main water protection measures that ensure the creation of continuous low-water permeable screens that prevent soaking below the underlying subsident soils. Summarizing the conducted research, the manual on backfilling of pits was used.

When building on subsident soils, in addition to this, the high-quality performance of backfillings and embankments is one of the main water protection measures that ensure the creation of continuous low-water permeable screens that prevent soaking below the underlying unaffected loess-like and subsident soils.

DISCUSSION

Proceeding from the above, it is necessary to study the areas of possible manifestation and spread of geological and engineering-geological processes and phenomena by forming a system for ensuring engineering-geological safety of comprehensively developed urbanized territories of the city. These processes in the research area were studied by O.K. Lange (1928)., M.M. Reshetkin (1929)., G.A.Arkhangelsky (1936)., V.L.Dmitriev (1940)., A.I.Islamov (1961-70)., A.M.Khudoibergenov (1963-80)., S.M.Kasymov (1980-84)., V.A.Ismailov (1986-2015)., Azizov U.A., Petrukhina I.A. (1992-97)., etc.

From a geological and geomorphological point of view, Tashkent consists of two significant terraces of a lowered rocky Holocene terrace in the south of the city, and a 20 m higher Tashkent loess terrace in the central part of the city and in the north Adylov (2014)., Agzamova *et al.*, (2022)., Ismailov (2015).. The conditional border between these two terraces is the Chashtepinskoe highway, the Southern Railway Station, Shota Rustaveli Street, the Parkentsky market area. These terraces in urban terrain are important when choosing the direction and type of both underground (metro). and surface and aboveground arrangement of linear structures. The existing underground metro lines are located in the thickness of the 20-meter Tashkent terrace – a reliable layer of loess and loess-like soils.

For the first time in the practice of metro construction, construction was carried out in difficult conditions with an estimated seismicity of 8-9 points. Therefore, the structures of stations and distillation tunnels made of precast-monolithic reinforced concrete are designed not only for the perception of permanent and temporary loads, but also for the action of inertial forces of rock movement at the time of an earthquake. The structure has sufficient rigidity and stability for conditions of high seismicity of the area and subsidence of soils, the transmission of only vertical loads on the ground is ensured.

Thus, the degree and nature of the impact of the construction and operation of the Tashkent city facility are largely determined by the construction technologies, the depth of the foundation and, in addition to this, the qualitative implementation of backfill associated with the size of the structure, local geomorphological, engineering-geological, hydrogeological and other conditions of the territory. The impact of construction work and backfill on soils not affected by construction and groundwater is manifested in the form of: 1). static and dynamic loads; 2). changes in the groundwater regime; 3). changes in the stress state, soil properties, etc. Abelev (1979)., Adylov (2014)., Agzamova *et al.*, (2022).

Subsidence of the earth's surface: - static loads on the rock thickness from the weight of buildings and structures, resulting in compaction of the foundation soils. Compaction of rocks under the weight of their own weight, increased pressure due to the movement of vehicles and power is accompanied by a decrease in their humidity and porosity and an increase in density Agzamova *et al.*, (2022), Ismailov (2015).

According to the conducted research, the causes of surface deformation are clearly identified as a group related to the period of operation of structures, but due to the influence of construction activities carried out in the

immediate vicinity of the building. 58% of cases of deformation belong to this class, only 14% belong to the class of other causes of the exploited period, and 28% of cases belong to the class associated with errors in the survey, design and construction of the surveyed object itself.

To the negative processes associated with the consequences of backfilling of an underground subway structure, the presence of subsidence soils of the base is added, which are structurally unstable and prone to rapid vertical deformations when the groundwater level rises or flooding Agzamova *et al.*, (2022)., Begimkulov, (2021)., Zakirov (2022)., Ismailov (2015)., Zakirov *et al.*, (2022).

According to the results of testing the sides of the underground pit along Akhmat Donish Avenue, the soils consist of loess and loess-like deposits of category II subsidence. The considered subsidence and mulds of the surface within the study area are mainly confined to the backfill zone for the construction of the underground structure of the Yunusabad metro line. The backfill soils of the construction structure of an underground structure are everywhere exposed to atmospheric precipitation and partially leaks from water supply, sewerage and heat supply water systems. According to the project, a technological opening is arranged in the underground part of the retaining walls of the underground structure, for the passage of engineering communications (water supply, sewerage, heat supply, electricity). The existing drainage system does not cope with the tasks of timely and complete drainage of stormwater. The water moves first within the tray, then it washes itself a channel and gets into the backfill mass. In most cases, surface and atmospheric waters interact with external dynamic loads from underground and aboveground transport, sinkholes form, the formation of mulds and the liquefaction of backfill soils.

CONCLUSION

Analysis of research materials on the process of subsidence of surfaces along Ahmad Donish Avenue are the result of surface water, water leakage from underground utilities, and the main causes of their formation are considered to be:

- loss of strength of backfill soils during water saturation;
- increase of dynamic loads on the surface of areas with backfill soils.
- trenches and pits developed in loess and loess-like soils, at intersections with existing roads and other territories with road surfaces, should be filled to the full depth using sandy, pebble soil, gravel screening or other similar materials that are slightly compressible with a deformation modulus of 20 MPa or more.

REFERENCES

- Abelev MYu (1979).** Fundamentals of design and construction on subsident macroporous soils. M. Stroyizdat, 270.
- Agzamova IA, Zakirov MM, Normatova NR, Begimkulov DK, Kholzhigitov ShB (2022).** Some engineering and geological processes affecting the development of the city's infrastructure. *Geology and mineral resources*. Tashkent: 4, 55-60.
- Begimkulov DK (2021).** Modeling and predictive assessment of flooding and drainage of the territories of the city of Karshi. Autoref. For the doc. Philosophy (PhD). geol.-min. sciences. -Tashkent: UMID DESIGN, 45.
- Gerasimov M (1980).** Guide to the device of backfilling of pits with the preparation of bases for technological equipment and floors on subsidence soils. M. Gerasimov NIIOSP, Moscow: Stroyizdat, 41.
- Ismailov VA (2015).** Engineering and geological conditions of the underground space of Tashkent. Tashkent: Tashstu, 160.
- Zakirov MM (2022).** Engineering Geodynamics. Tashkent: UMID DESIGN, 284.
- Zakirov MM, Begimkulov DK, Normatova NR, Gulyamov GD (2022).** Engineering and Geological Processes of Urban Territories// *International Journal of Advanced Research in Science, Engineering and Technology*. IJARSET, 9, 6, 3619-3622

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