ENGINEER

international scientific journal

ISSUE 2, 2025 Vol. 3
E-ISSN
3030-3893
ISSN
3060-5172

A bridge between science and innovation

TOSHKENT DAVLAT TRANSPORT UNIVERSITETI
Tashkent state transport university

ENGINEER

A bridge between science and innovation

E-ISSN: 3030-3893

ISSN: 3060-5172

VOLUME 3, ISSUE 2

JUNE, 2025

engineer.tstu.uz

TASHKENT STATE TRANSPORT UNIVERSITY

ENGINEER

INTERNATIONAL SCIENTIFIC JOURNAL
VOLUME 3, ISSUE 2 JUNE, 2025

Founder of the international scientific journal "Engineer" – Tashkent State Transport University, 100167, Republic of Uzbekistan, Tashkent, Temiryo'lchilar str., 1, office: 465, e-mail: publication@tstu.uz.

The "Engineer" publishes the most significant results of scientific and applied research carried out in universities of transport profile, as well as other higher educational institutions, research institutes, and centers of the Republic of Uzbekistan and foreign countries.

The journal is published 4 times a year and contains publications in the following main areas:

- Engineering;
- General Engineering;
- Aerospace Engineering;
- Automotive Engineering;
- Civil and Structural Engineering;
- Computational Mechanics;
- Control and Systems Engineering;
- Electrical and Electronic Engineering;
- Industrial and Manufacturing Engineering;
- Mechanical Engineering;
- Mechanics of Materials;
- Safety, Risk, Reliability and Quality;
- Media Technology;
- Building and Construction;
- Architecture.

Tashkent State Transport University had the opportunity to publish the international scientific journal "Engineer" based on the **Certificate No. 1183** of the Information and Mass Communications Agency under the Administration of the President of the Republic of Uzbekistan. **E-ISSN: 3030-3893, ISSN: 3060-5172.** Articles in the journal are published in English language.

Engineering and geological investigations for construction and rehabilitation in saline soil regions of Uzbekistan

S.S. Shaumarov[1][a], N.R. Mukhammadiev[1][b], O. Zafarov[1][c], S.I. Kandakhorov[1][d], Z.O. Okilov[1][e]

[1]Tashkent state transport university, Tashkent, Uzbekistan

Abstract: This article provides information on conducting engineering-geological studies in the design and construction of buildings and structures in the saline soil regions of our Republic. A number of scientific studies related to the assessment of emergency situations of buildings and structures that occur during the use of saline soils are being conducted in the world. In our country, certain achievements are being made in conducting engineering-geological and hydrogeological research works for the safe and efficient operation of buildings and structures in the areas where saline soils are spread.

Keywords: buildings and structures, design, construction, engineering-geological research, hydrogeological research, soils

1. Introduction

Nowadays, large-scale construction work is underway in our country. The projecting and construction of buildings and structures in complex climatic conditions require specific researches. Engineering-geological surveys on soil-based sections with high humidity are carried out according to a special program specified in the terms of reference. The software and terms of reference are developed jointly by the project and exploration organizations. The materials obtained as a result of the search should, in general, allow you to:

1. Quantitative assessment of the stability of the foundation;
2. Predict the value and duration of the subsidence of the base in the consolidation process.

In general, these materials should be evaluated to ensure that the high-moisture layer can be used as the lifting base material.

The program can be edited after receiving the current information by the project organization during the search. In the projecting and construction of buildings and structures in complex climatic conditions, engineering-geological surveys can include the following types of work:

1. Collection, analysis and summarization of search and previous years materials;
2. Obtaining and decoding aerospace survey materials;
3. Recognition inspection in conjunction with aerial and route observations;
4. Crossing mountain carvings;
5. Geophysical study of the area;
6. Field inspection of soils;
7. Hydrogeological research;
8. Stationary observations;
9. Study of soil and water in the laboratory;
10. Predicting possible changes in engineering-geological conditions;
11. Processing of materials in the room;
12. Preparation of technical report (conclusions) [1].

Literature review. During the operation of buildings and structures built on saline soils, man-made levels of underground water are formed under the structure due to natural and artificial factors. The rise of the underground water level and the wetting of the foundation soils cause the uneven settlement of the structure, which leads to emergency situations, as a result of which excessive costs are incurred. Major researchers of the world and our country engaged in the study of the effect of the amount and type of salts in the saline ground base on its physical and mechanical properties: M.D. Braja, G.P. David, W. Kuhn, B.G. Neal, A.R. Arutyunyan, I.L. Bartolomey, V.M. Bezruk, P.B. Babakhanov, A.A. Glaz, A.I. Grot, R.S. Ziangirov, N.P. Zatenaskaya, M.F. Yerusalimskaya, M.O. Karpushko, A.K. Kiyalbaev, A.A. Kirillov, N.A. Klapatovskaya, У.V. Kuznesov, A.D. Kayumov, T.Kh. Qalandarov, S.S. Mordovich, A.A. Mustafayev, N.S. Naletova, A.E. Oradovskaya, V.P. Petrukhin, B.P. Rakhmanov, У.D. Rozhdestvensky, A.L. Rubinshtein, У.M. Sergeyev, A.V. Sukhorukov, M.N. Terleskaya, B.T. Teltayev, N.N. Florov, R.M. Khudaikulov, V.P. Shulgina, I.K. Aimbetov, I.A. Agzamova and others[2,3].

2. Research methodology

In collecting, analyzing and summarizing the research materials of previous years, it is necessary to pay attention to the history of development of geology of the region in the Quaternary period and data on the analogy of the district. Special attention should be paid to the generalization of data on anthropogenic impacts leading to groundwater level rise and swamping in the construction area, as well as the development of swampy, lake, lagoon, alluvial and mixed genesis deposits during route monitoring. It is necessary using different methods of geophysical research in the study of the strength of soils in the maximum volume to study the distribution and thickness of soils in high humidity, as well as in the upper part of the surface. Processing of search materials in the room should be carried out during the field work for timely editing of the survey, as well as in the

[a] https://orcid.org/0000-0001-8935-7513
[b] https://orcid.org/0000-0002-3689-8794
[c] https://orcid.org/0009-0006-8828-1645
[d] https://orcid.org/0000-0002-3689-8794
[e] https://orcid.org/0009-0006-8828-1645

process of drawing conclusions to obtain information about the high-moisture soil layer at the base of the projected lift.

Data on the presence of high-moisture soils, their properties, distribution and properties are collected taking into account the data of previous years and the construction experience in the given area. It is necessary to use aerial photography and space survey data. In the absence of sufficient information on the distribution, genesis, thickness, composition, condition and properties of soils, as well as hydrogeological and geomorphological conditions of the study area, a reconnaissance search is established.

The composition and scope of exploration work in the plan and depth according to RST Uz 20522-95 to distinguish engineering-geological elements, normative and calculated values of soil properties, including strength and deformation characteristics; hydrogeological measurements, measurements of the intensity of development of geological processes, as well as the aggressiveness of groundwater should be sufficient to determine.

It is recommended that the scale of engineering-geological surveys be 1: 10000-1: 2000. A scale of 1: 1000 and smaller can be obtained based on the search program, respectively. The results of geophysical studies of soil thickness at high humidity first supplement the data obtained during the reconnaissance study on the inhomogeneity of its structure, the direction and velocity of groundwater, the variability of physical and mechanical characteristics of soils at high humidity.

The main types of work to be carried out at this stage of the project are: engineering-geological survey, route monitoring, geophysical surveys, sampling of wells and drilling of wells on the ground with high humidity.

It is proposed to carry out engineering-geological survey on a scale of 1: 10000-1:5000. Electro-intelligence and seismoacoustic profiling, georadiolocation are proposed as the main method of geophysical research. Drilling wells will be drilled in the form of a 50x50 m net, depending on the size of the study area, based on aerial photography, at a distance of 150 m on both sides of the route axis. Samples are taken from high-moisture soils every 0.5-1.0 m in depth when passing sounding drilling wells. Materials on the hydrogeological order of the stratum are collected. Salinity often accumulates salts of sulfuric, hydrochloric, and carbonic acids, and in some cases, sodium and potassium salts of nitric acid in the desert. This is very harmful for most species.

3. Results and Discussion

The main factor in the formation of saline soils is the mineralized groundwater and saline rocks lying close to the surface. Therefore, saline soils are found in impermeable plains, deserts and hilly areas. The description of salinity is directly related to the hydrogeological and geomorphological conditions of the site. The foothills are composed of carbonate rocks, usually unsalted soils. In the soils of the foothills and valleys, water-soluble sulfates and partially chlorides are found. As the areas deepen, the amount of salt in the soil increases, in particular, under conditions of loose drainage and when the groundwater lies nearby. The importance of chlorides in the salt content of the lower reaches of river valleys is significant. As we move away from the mountains, the carbonate rocks are replaced by non-carbonate ones, followed by chloride-sulphate, sulphate-chloride, and finally chloride-type saline areas[4, 5].

The strength and compaction of soils should also be taken into account when projectinging and constructing buildings and structures in saline areas. Sedimentary rocks are compressed by external forces, resulting in a decrease in their porosity and volume [5, 7].

The compression process is represented by the compression resistance, the compression coefficient, and the compression modulus.

The compression limit of rocks is equal to the value of the force expended for their maximum compression, expressed in MPa. When soils are compacted by external forces, their particles condense and their porosity decreases.

Under the influence of external forces of soils, compression without lateral expansion is called compression compression. Compression is determined by reducing the volume of the soil as a result of the gradual increase of forces in the hydroproject copying device of the sample taken from the soil [8].

4. Conclusion

Thus, when the amount of calcium carbonate in the soil is less than 5%, it is not decided as necessity, and when it is between 5% and 25%, the soil is called calcified. Typically, large amounts of carbonates occur in dusty soils of various origins. Ground salts can dissolve under the influence of water and other solutions and spread within the soil. The release of soluble salts from the soil is called quantity or salt leaching or chemical suffocation. When the soil is exposed to certain solutions of salts as well as acids and alkalis, it is possible to completely remove not only weak and moderately soluble, but also difficult-to-dissolve salts from the soil.

In addition, strong and moderately soluble salts (chlorides and sulphates), weakly soluble compounds (carbonates, sandstones, iron oxides) are also released as a result of long-term exposure to saline soils. They are the natural cements of soils, which determine their strength and deformation properties. Therefore, the removal or weakening of such natural cements changes the composition and structure of the soils and determines the change in their properties. In saline dusty soils with a content of easily soluble salts less than 5%, suffocation subsidence is low and of practical importance [11, 12].

References

[1] Aripova F.A., Miraslanov M.M. and others. Physico-mechanical properties of rocks of ore deposits of Uzbekistan reference Tashkent - 2006. S-221.

[2] Miraslanov M.M., Zakirov M.M. Engineering-geological processes developed in solid mineral deposits of Uzbekistan: assessment and forecast. – T.: State Enterprise “Institute GIDROINGEO”, 2015. S-72.

[3] Miraslanov M.M. Engineering geology, hydrogeology of solid mineral deposits in Uzbekistan. –T.: State Enterprise “Institute GIDROINGEO”. –2011. –P.100–164.

[4] Kurbanov E.Sh., Kayumov A.D., Akhunzhanov A.M., Abdurakhmanov B.M. Preventive measures based on hydrogeological and engineering-geological processes caused by natural and man-made conditions during mining.

Regional Geology and Metallogeny No. 93/2023. P.107-116.

[5] Kurbanov E.Sh. Forecasting zones of formation of hydrogeological and engineering-geological processes in connection with the underground development of deposits of solid minerals in the Nurata-Zarafshan mining region. –M.: –2021. No. 11.– pp. 34–39.

[6] Shermatov M.Sh., Umarov U.U., Rakhmedov I.I. Hydrogeology. Tashkent-2007, 119 – 170 b.

[7] Kurbanov E.Sh., Akhunjanov A.M., Isomiddinov Ya.Ya. Hydrogeological and engineering-geological conditions of the Guzhumsay deposit. // International Journal of Geology, Earth & Environmental Sciences Centre for Info Bio Technology, Jaipur, INDIA. 2020. September–December. P.31–34.

[8] Melikulov R.A., Khudoykulov A.A. Features of the development of sinkholes in the southwestern territory of Uzbekistan and the main factors of their formation // Materials of the I Intern. sci.-tech. conf. "The role of science and practice in strengthening the sustainability and updating the risk management of the manifestation of exogenous geological processes"– T :SE "IMR".– 2019.- P.47–51.

[9] Zafarov O., G'ulomov D., Murodov Z. Conducting engineering-geological researches on bridges located in our country and diagnosing their super structures, methods of eliminating identified defects //AIP Conference Proceedings. – AIP Publishing, 2023. – T. 2789. – №. 1.

[10] Bobojonov R., Zafarov O., Yusupov J. Soil composition in the construction of engineering structures, their classification, assessment of the impact of mechanical properties of soils on the structure //AIP Conference Proceedings. – AIP Publishing, 2023. – T. 2789. – №. 1.

[11] Maxkamov Z. et al. Conducting engineering and geological research on the design and construction of buildings and structures in saline areas //AIP Conference Proceedings. – AIP Publishing, 2023. – T. 2789. – №. 1.

[12] Kayumov A., Zafarov O., Kayumov D. Changes of mechanical properties in humidification saline soil based in builds and constructions //AIP Conference Proceedings. – AIP Publishing, 2023. – T. 2789. – №. 1.

[13] Hudaykulov R. et al. Filter leaching of salt soils of automobile roads //E3S Web of Conferences. – EDP Sciences, 2021. – T. 264. – C. 02032.

[14] V. P. Petrukhin, Construction of structures on saline soils. -M.: Stroyizdat, 1989. -264 p.

[15] Maslov N. N. Fundamentals of engineering geology and soil mechanics. Textbook for high schools. – M.: Higher School, 1982.- 511 p.

[16] Dmitriev V.V., Yarg L.A. Methods and quality of laboratory study of soils: textbook / V.V. Dmitriev, L.A. Yarg. –M.: KDU, 2008. - 502 p.

[17] Trofimov V. T., Koroleva V. A. Laboratory work on soil science. –M.: KDU, University book, 2017. - 654 p.

[18] Maxkamov Z. et al. Conducting engineering and geological research on the design and construction of buildings and structures in saline areas //AIP Conference Proceedings. – AIP Publishing, 2023. – T. 2789. – №. 1.

[19] GOST 22733-2002. Grunts. The method of determining the maximum density in laboratory conditions.

[20] SHNQ 1.02.09-15. Engineering-geological explorations for construction. -Tashkent: Davarkhitektkurilishkom. 2015. - 152 p.

Information about the author

Shaumarov Said Sanatovich	Tashkent State Transport University "Building and industry facilities Construction Department professor (DSc), E-mail: shaumarovss@mail.ru Tel.: + 998712990026 https://orcid.org/0000-0001-8935-7513
Mukhammadiev Nematjon Raxmatulla-yevich	Head of the department of "Building and industry facilities construction", Tashkent State Transport University, DSc Phone.: + 998909111106 https://orcid.org/0000-0002-2306-3317
Zafarov Olmos	Tashkent State Transport University, Independent researcher, PhD, docent E-mail: olmos.zafarov@mail.ru Tel.: +998952651000 https://orcid.org/0009-0006-0226-6349
Kandakhorov Sanjar Ishratovich	Tashkent State Transport University "Building and industry facilities Construction Department associate professor (PhD), E-mail: sanjar.kandakharov@mail.ru Tel.: + 998500717191 https://orcid.org/0000-0002-3689-8794
Okilov Zafar Omon ugli	Tashkent State Transport University, support doctoral student E-mail: zafar00700792@gmail.com Tel.: + 998903279009 https://orcid.org/0009-0002-5946-2050

CONTEXT / MUNDARIJA