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Development and application of multi-component cement composite materials with improved performance for construction and repair purposes

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Abstract: This article presents information about changes in the mechanical properties of saline soils based on constructions as a result of wetting. The analysis of deformations in buildings and structures in areas where saline soils are spread in the territory of Uzbekistan shows that the main factor of their occurrence is the change of the physical and mechanical properties of the underlying soils under the influence of water. It means that in the design of the structures of the risers consisting of the bases with saline soil, it is necessary to take into account the changes of the types and amounts of salts during their use and their influence on the calculation indicators. Groundwater is in continuous movement, and in nature there is a large and small circulating active flow of water. During this movement, the volume, quantitative state, physical (ice, vapor, liquid) and chemical properties of groundwater can change.

Keywords: structures, soil, saline soils, mechanical properties, deformations, groundwater, active flow movement, salts

1. Introduction

Construction of buildings and structures in our country is often carried out in complex engineering-geological conditions, especially in areas with saline soils. These soils cover numerous regions of Uzbekistan such as Bukhara, Jizzakh, Syrdarya, Fergana, Khorezm and large areas of the Republic of Karakalpakstan. In Uzbekistan, saline soils, which can be used as a basis for the construction of buildings and structures, consist of saline, saline, saline and bald soils, differing in the composition and amount of slightly soluble salts. They are often formed in the depressions of the relief: mountain slopes, lowlands, saline lake shores, cliffs, desert zones formed as a result of suffocation, mineralized waters close to the surface (1 - 3 m). The main factor in the formation of saline soils is the mineralized groundwater and saline rocks that lie close to the surface. The main condition for salinization is the impossibility of water flow in places and the fact that the amount of evaporation is greater than the amount of precipitation.

Analysis of the existing literature on saline soils and experience in the design and construction of buildings and structures in different regions of the country, as well as special studies on saline soils show that changes in the composition, structure and physical and mechanical properties of substances during wetting and alkaline leaching. and this phenomenon needs to be taken into account in design work.

As a result of flooding and wetting of areas composed of saline soils, a number of major affects can occur in buildings and structures.

As mentioned above, the analysis of the emergency situation of some facilities in Uzbekistan shows that the forecast of changes in the mechanical properties of the foundations of buildings and structures should take into account the impact of factors affecting the decrease of mechanical properties (eg: long water infiltration, salinity, etc.). Existing guidelines and normative literature provide recommendations for determining the mechanical properties for saline soils with easy and moderately soluble salts, but the amount of difficult-to-dissolve salts is not taken into account.

Studies suggest that in order to ensure the safe operation of buildings and structures built on saline soils, it is necessary to study the process of leaching of insoluble salts, especially when the mechanical properties of the soil are exposed to long-standing water. An experimental study of the laws of change of mechanical properties of water from saline soils over a long period of time. This is because the issues of assessing the change in the mechanical properties of saline soils in the long-term exposure to water to insoluble salts have not been fully studied.

The saline loamy and loamy soils in the territory of Uzbekistan, in particular in Pakhtakor district of Jizzakh region, where capital, industrial and civil construction is currently booming, are taken as the object of research and its mechanical characteristics in the article.

The purpose of this dissertation is to develop a methodology for studying the mechanical properties of saline and sedimentary soils when used with water and solutions and long-term leakage, in order to use the parameters of soils in the calculation of the foundation of structures.

The main feature of saline soils is the change in their mechanical properties during the washing of salts, there are two main types of washing of salts:

- filter washing, in which the washing of the salt in the soil is carried out by the filtration flow of the liquid under the pressure gradient and is of practical importance for soils with high permeability;
- diffusion washing, in which the washing of the salt in the soil occurs as a result of the movement of ions due to the difference in the concentration of salts in solution. This is typical for low absorbent soils.

The laws of changing in salinity level and mechanical characteristics when saline soils are exposed to water for a long time under laboratory conditions were studied and expressions were proposed to predict them [1].

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Literature review. Existing guidelines and normative literature provide recommendations for determining the mechanical properties for saline soils with easy and moderately soluble salts, but the amount of difficult-to-dissolve salts is not taken into account. Studies suggest that in order to ensure the safe operation of buildings and structures built on saline soils, it is necessary to study the process of leaching of insoluble salts, especially when the mechanical properties of the soil are exposed to long-standing water. An experimental study of the laws of change of mechanical properties of water from saline soils over a long period of time. This is because the issues of assessing the change in the mechanical properties of saline soils in the long-term exposure to water to insoluble salts have not been fully studied. Many scientists have worked on engineering-geological research and their use. Including, M.D. Braja, G.P. David, W. Kuhn, B.G. Neal, A.R. Harutyunyan, I.L. Bartholomey, V.M. Bezruk, P.B. Babakhanov, A.A. Glaz, A.I. Grot, R.S.Ziangirov, N.P.Zatenatskaya, M.F.Уerusalimskaya, M.O.Karpushko, A.K.Kiyalbaнev, A.A.Kirillov, N.A.Klapatovskaya, Уu.V.Kuznetsov, A.D. Kayumov, T.Kh. Qalandarov, S.S. Mordovich and many scientists. The following scientists also studied the deformation and strength parameters of soils containing ocon and moderately soluble salts: Bezruk B.I., Glaz A.A., Dolmatov B.I., Lomize L.N., Povilonckiy V.M., Petrukhin V.P., Rozhdectvenckiy E.D., Ukhov C.B., Chokhonelidze G.N., Shulginoy V.P. and others. In 1983, V. M. Bezruk [12] developed classifications of saline soils for the construction of buildings and structures. The specificity of this classification is as follows: the amount of salts in the ground is taken into account starting from 0.3%, in which salinity is divided into two types: 1) chlorinated and chlorinated-chlorinated; 2) saturated, chloride-saturated and coda salinity. V.P. Petrukhin [12] developed a classification in which the minimum amount of water-soluble salts depends on the density of soils in accordance with the design goals of civil and commercial buildings and constructions.

2. Research methodology

Based on the task set and the results of previous research, the methodological part of the experiment was based on the following laws:

- In the process of interaction of ground distilled water with water, its structure changes as the amount of soluble salts in the water decreases.
- Changes in soil structure during alkali washing lead to a decrease in strength and an increase in deformation (additional suffocation subsidence).

Changes in the composition and volume of salts in the soil can affect the water-physical properties of soils, in particular, the composition of the microaggregate, plasticity parameters, viscosity, etc. After the initial grunt was thoroughly examined, the diffuser or filter lye was rinsed.

3. Results and Discussion

Changes in the composition, structure, and mechanical properties of (C, φ) solutions were evaluated due to the fact that solutions leave a certain amount of salts from the solution in a diffuse manner after prolonged exposure to distilled water (alkaline washing rate-β). Filtration of salts in the soil is carried out according to the lifting current scheme in the FIM device. A pre-tested sample of the natural structure was placed on the device according to the same scheme. B on the side surfaces of the sample for loss of filtration on стенке.P.It it was processed in accordance with the methodology proposed by Petrukhin [1]. The sample was scraped off with a diameter smaller than the ring of the F-IM tool (D=50 cm^2), plastic glue on its side surfaces is rubbed into the groove, and wax is poured into the gap between the ring and the sample. This treatment allows us to calculate that the liquid moves only through the volume of the soil.

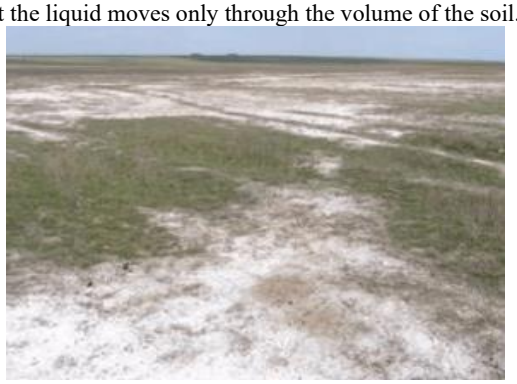

Fig. 1. View of the saline areas in the saline area of our country

Filtration washing with alkaline was carried out under pressure, often without squeezing the soil, that is, the soil was in conditions of constant volume during the experiment. Water filtration was carried out under the influence of high pressure gradients (up to J = 100), which formed a column of water. The limit value was determined by a jump (J=10, 30, 60, 100), slowly, not in one piece. During the experiment, the filtrate was selected to determine the amount of washed salts, its volume and minerals were recorded. To determine the consistency characteristics of the studied grinds, instruments developed by the "Gidroproekt" system are used, registering a uniformly cut surface [2]. Depending on the physical condition of the soil, methods of rapid cutting of samples are used.

Grinding machines, the structure and humidity of which are a natural method of rapid cutting, are tested without prior condensation. The amount of moderate pressure at which cutting is performed is selected taking into account the thickness of the soil and the weight of the structure. After a moderate load is set, experimental work is carried out no later than 5 minutes after the start of the pulse load generator.

Locker rooms were given with splashes. Their volume was determined by the value of moderate pressure and was 5% of its volume. Each stage was carried out until the deformation was conditionally stabilized (0.01 mm/min). After the filtration process was completed, the amount of salt was determined in the "Solemer" device of the PNIIIS design [5].

4. Conclusion

A study conducted to study their salinity characteristics and the degree of salinity associated with the amount of initial plaster and the degree of salt leaching during prolonged exposure to water based on salt gratings of buildings and structures allows us to draw the following conclusion. Salts of complex soil, in particular, when water enters the mush with which the plaster is salted for a long time, give them a description of the consistency and amount of salt in them, that is, the degree of salinity decreases, which

in turn leads to a decrease in the stagnation of the foundation of buildings and structures and additional deposition. Before designing buildings and structures, it is necessary to determine the initial salinity and solubility of salt – the degree of alkalinity and, accordingly, the salinity characteristics, as well as the degree of salt leaching - the initial salinity of the salty soil of the area in depth.

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