СЕКЦІЯ 6.
СУЧАСНІ ЕФЕКТИВНІ ТЕХНОЛОГІЇ У БУДІВНИЦТВІ, АРХІТЕКТУРІ ТА ДИЗАЙНІ. ГЕОДЕЗІЯ ТА ЗЕМЛЕУСТРІЙ

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QUALITATIVE AND QUANTITATIVE PARAMETERS OF THE "BASE-FOUNDATION" SYSTEM IN THE FORMATION OF A LOCALLY COMPACTED VOLUME OF SOIL MASSIF

The process of interaction between soil bases and the foundation when they are loaded is a local compaction of the soil under the foundation sole as it settles. At the same time, the stresses causing this compaction actually extend to a finite depth, contrary to theoretical ideas.

It is possible to clearly group two main approaches to the shape of the volume of compacted soil based on foundations.

This is a classical theoretical representation of its volume in the form of the so-called “bearing column”, proposed by Terzaghi K. [1], Goldstein M.N., Medkov E.I. [2], Kushner S.G. [3]. This direction received further private development in the works [4, 5].

In this paper, we consider the soil massif as an infinite-depth, layered, heterogeneous composite building material. The term "composite" covers a wide range of concepts. These can be building (or other) materials made from mixtures of various components (crushed stone, sand, cement) uniformly distributed throughout the volume in the form of building solutions and concrete, etc.

On the other hand, these are sharply heterogeneous rod, flat or spatial structural systems, integrated from homogeneous materials of different nature and state. As a rule, they are various forms of sharply heterogeneous so-called sandwiches, which can consist of anything (wood, polymers, metals, resins, fibers).

Here we examine the process of adaptation of a natural soil massif and its locally formed compacted volume during the interaction of the “base-foundation” system. Moreover, its construction properties change discretely both in plan and in the depth of the half-space.

The presented experimental qualitative and quantitative parameters of this system show the influence of the width and pressure along the foundation sole on the depth of the compacted zone in which resistance to external load is formed when the force impact changes.

The indicated variability can occur over time, due to the duration of the historical process of genesis of sedimentary rock strata. It can be caused by technogenic factors.

Heterogeneity is expressed in fluctuations in physical, deformational, and strength in the natural state, both during alternation and within each of the soil layers. The above variability and changeability are superimposed on the physical technogenic consequences of the effects of external loads from the foundations of above-ground structures [6].

An experimental approach to determining the actual parameters of the deformation zone under foundations was developed in the developments of the Department of Foundations and Foundations under the leadership of V.N. Golubkov [7 – 9] and Yu.F. Tugaenko [10, 11].

The substantiation of the main, and ultimately final, dimensions of the deformation zone was obtained by performing numerous experimental studies of foundations in field conditions.

Foundations of various widths, shapes and areas were used in the experiments. The load on the foundations was applied in stages. The criterion for stabilizing the settlement was 0.1 mm/day. Point depth marks of various designs and discrete linear clamps, which are pre-installed in the base of the foundation, served as "sensors" of layer-by-layer soil movements.

An additional control of the deformation zone contour was the collection of soil density samples along a square grid in the plane of the exposed base under the foundation.

The obtained generalized research data are presented in the form of graphical dependencies in Fig. 1.

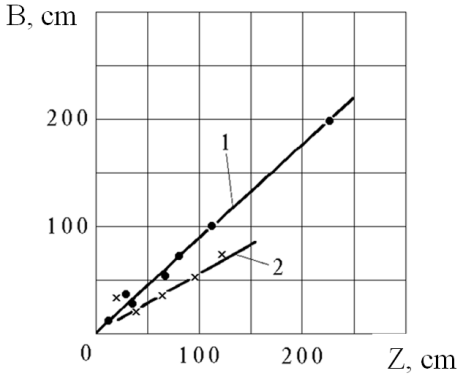

Fig. 1. – Generalized graphs of the dependence of the depth of the compacted zone Z on the width of the foundation for specific pressures of 0.2 MPa (1) and 0.3 MPa (2) along its sole

Conclusions. The resistance of the soil base to external force impact is determined by the adaptation of its compacted volume to the natural mass. The compaction (deformation) zone has finite dimensions, the depth of which is in direct functional dependence on the width and pressure on the foundation base.

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