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THE ELASTIC-PLASTIK ANALYSIS OF CARRY FACULTY OF SYSTEM "FOUNDATION-BORESTUFFING PILE" BY METHOD OF LIMITED ELEMENTS.

In basis procedure lie MGE and equalizations of calculations. The results of analysis rotined relatively a complete coincidence with experimental information.

***Keywords**: The elastic-plastic analysis, borestuffing pile*

Introduction

As a result of sharp increase of volumes of the use of borestuffing piles in building there is a necessity of development of method of their calculation by modern numerical methods taking into account non-linearity of their work. The printed piles on the sites of constructions use for difficult gruntovykh terms, with the considerable thickness of prosadochnikh breeds, at complication of the use of stuffing piles in built-up districts (possibility of deformation of nearby structures), at the uneven partition of vertical load and presence of horizontal constituents. At their use noise is eliminated from work hammers, the questions of multiplying the d³ametra barrel of pile (to 1,5m anymore) and depth of zalozheniya decide easily (to 60m). Borestuffing of pile have features of resistance at comparison from with stuffing, and also yet not all questions of features them work it is possible to consider to a full degree completed. The separate require theoretical and experimental development.

Raising is tasks, decision correlations.

In the article on MGE bearing strength of borestuffing pile is certain, the chart of diskretization of which is resulted on a fig. 1.

A pile in a numerical calculation is examined as a homogeneous cylindrical body, which is not deformed with a permanent on a height crossrunner, bearing vertical squeezing axleloading. In obedience to methods which are represented in normative documents, border resistance such construction concernes resistance of soil destruction under a lower end and resistance displacement on the lateral surface of body of pile and soil.

As is generally known, pile foundations can not have large bearing strength, what tot soil on which they pass loading.

Length of pile got out from geological terms a construction site with the strict conforming to normative requirements, that weak soils must be cut through piles and an edge must abut against dense soils on 1,5-1m.

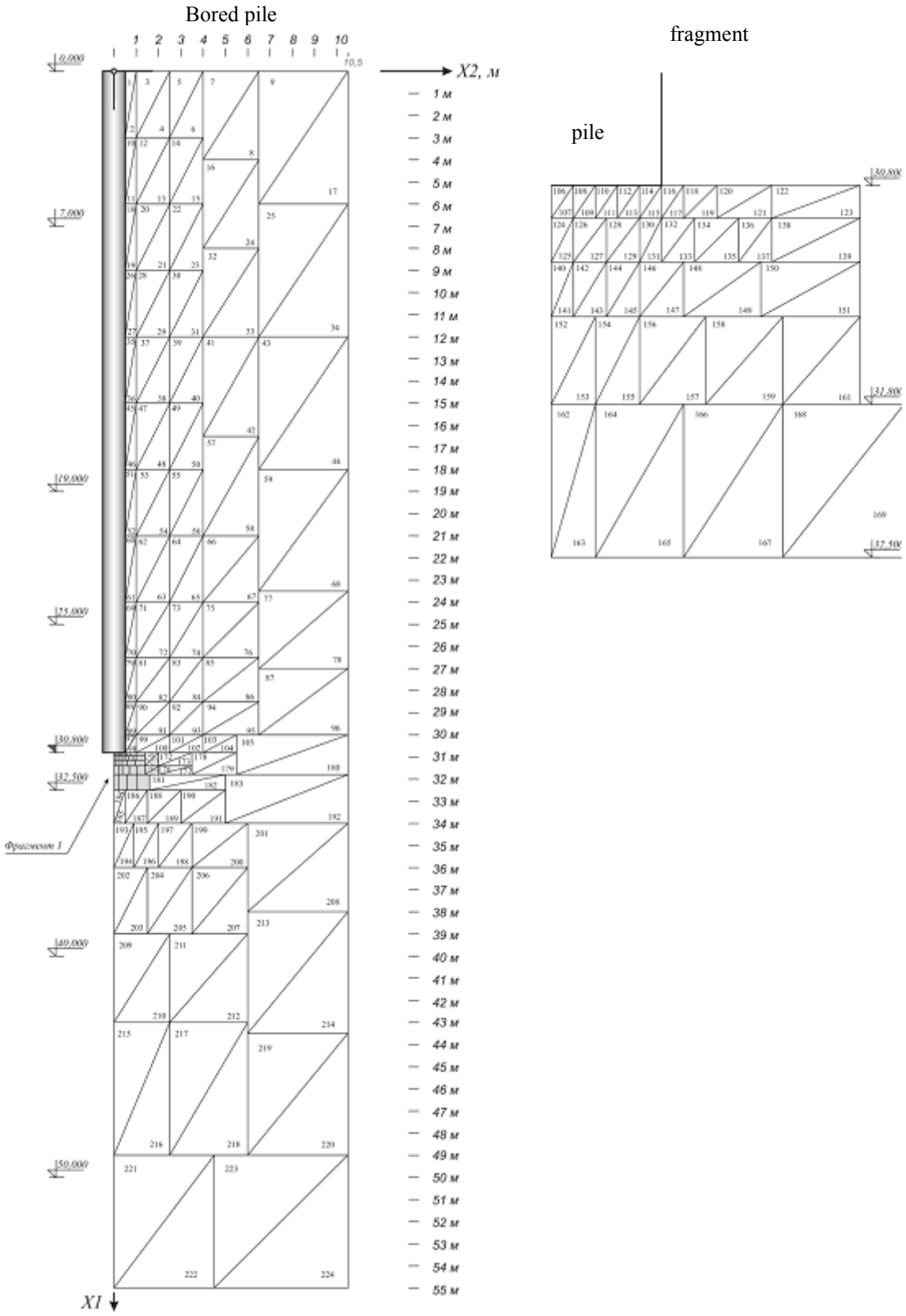

Fig. 1. The scheme of discretization of active zone of borestuffing pile

The feature of work of borestuffing piles is absence of area of compression, which appears at deepening of stuffing pile. Soil under an edge and lateral surface in borestuffing piles is almost in the natural state (in stuffing piles they at deepening are partly made more the compact).

In research of VAT of borestuffing pile the spatial version of resiliently-plastic dilatansion model of soil is used on the basis of diagram of Prandlya with physical equalizations of law of

Hooke (on the untillimited stage of deformation), condition of fluidity of Mizesa-Shleykhera-Botkina and correlations of neasotsiirovannogo law of plastic fluidity [2, 3]. Procedural foundation of calculation - MGE and equalizations of calculations [3]. The accepted calculation model is complemented the program which provides automatic execution and analysis of results of calculation.

Determination of bearing strength of pile and contraction of foundation from the action of the vertical loading was made by the decision of axisymmetrical task in the resiliently-plastic raising of MGE in such sequence:

diskretization of border surface of pile and active (by a buffer) zone soil (fig. 1);

arrangement by a calculation matrix influences of MGE on the basis of decisions of R. Mindlina for a resilient semiplane;

record of the calculation system of equalizations;

decision of SLAR, receipt of VAT of the system on each step loadings;

building of areas of the border state of basis (plastic areas);

acceptance ground of project decision about possibility of appendix of the additional loadings.

The program allows to forecast the change (more frequent increase) of areas of calculations of border VAT of grounds at the additional loadings or moistening foundation.

As a border of correctness of the use of theory of resiliency at determination of contraction of borestuffing pile settling of S=1sm is taken from an experiment.

Opening of integrals of calculations was conducted the numerical methods of the double squaring of Gausse.

The analytical condition of passage-way of border VAT was based on the experimentally set dependences of border resistance of displacement on the size of operating tensions $\tau = f(\sigma)$ [2].

Durability of soils at displacement in the conditions of the difficult tense consisting of work was estimated the oktaedrichnoy theory of durability which takes into account the spatial napruzhennnoe state of soils on oktaedrichnym grounds, equal the main tensions inclined to the plane. The condition of durability was adopted in the form of cone (on Mizesu-shleykheru-botkinu).

On Mizesu-shleykheru [2]:

$$\sigma_{\text{окт}} = (\sigma_1 + \sigma_2 + \sigma_3)/3 \tag{1}$$

$$\tau_{\text{окт}} = f(\sigma_{\text{окт}}) = \left(\sqrt{(\sigma_1 - \sigma_2)^2 + (\sigma_2 - \sigma_3)^2 + (\sigma_3 - \sigma_1)^2}\right)/3 \tag{2}$$

where σ_1, σ_2, σ_3 - are main tensions.

Dependence between normal tensions and on a tangent plane (on L. And. Botkinu) accepted tangent linear:

$$\tau_{\text{окт}} = ((\sigma_{\text{окт}} + H)\text{tg}\,\psi), \text{ at } \sigma_{\text{окт}} \le P_0 \tag{3}$$

$$\tau_{\text{окт}} = ((P_0 + H)\text{tg}\,\psi), \text{ at } \sigma_{\text{окт}} > P_0 \tag{4}$$

where $H = C_{\text{окт}} \cdot \text{ctg}\,\psi$ – where is border resistance comprehensive tension; $\psi = \varphi_{\text{окт}}$ – a corner of friction on an octahedral plane; $C_{\text{окт}}$ – a parameter of durability; P_0 – a parameter, characterizes a transition from a cone to the cylinder.

Descriptions of gruntovogo array [1]: in an epiphase nasypnoy soil to 7 m and layer of weak ozerno-alyuvial'nykh deposits to 12 m which on a depth about 19 m are laid supesyami of mainly fluid consistency, and from a depth 25 m are jurassic clays of noncompressed and hard consistency. In a calculation resistance is accepted squeezing effort (module of deformation). $E = 15.28$ МПа, $C = 27.87$ кПа, $\varphi = 20.65^\circ$, $\rho = 1.8032$ g/sm^3, $\rho_{\max} = 2.711$ g/sm^3, $\rho_{\min} = 1.648$ g/sm^3, $P_0 = 2$ МПа.

The graph of calculation dependence of settling of foundation from loading is represented on a

fig. 2. Information of numerical prognostication on MGE was compared to the static tests of this pile of prof. á. In. Bakholdinym, A. V. Dranitsinim [1] (fig. 2).

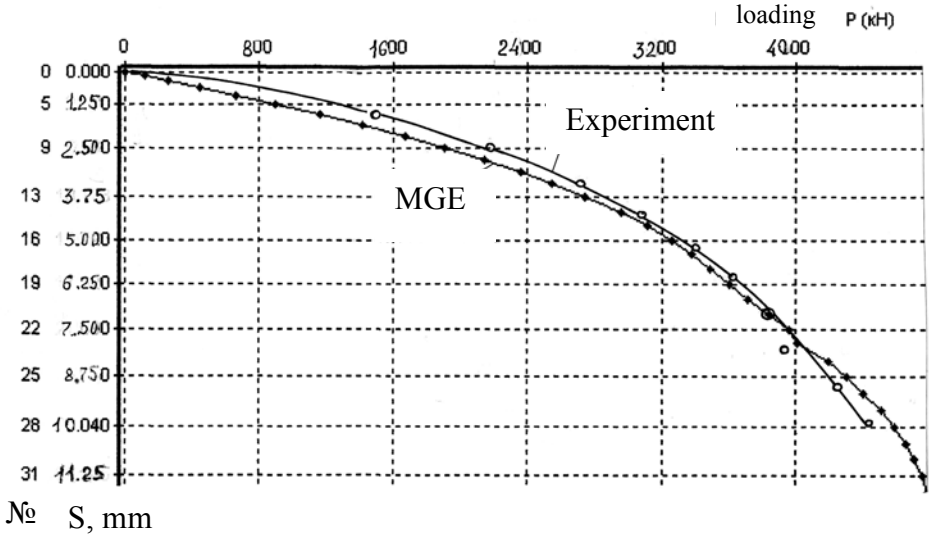

Fig. 2 is the Graph of dependence of settling of borestuffing pile from loading

Conclusions

The printed piles are an absolute decision of many problems of grounds and foundations in modern building, therefore there is a necessity of development of method of their calculation by modern numerical methods. In basis protseduri lie MGE and vyshenapisannye equalizations of calculations. The results of analysis rotined relatively a complete coincidence with experimental information.

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