Theoretical analysis of dynamic compacting of the soil around a spherical source of explosion(*)

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THEORETICAL study of explosive compacting of the soil method is limited in the present paper to the analysis of the solution of the large pressure shock wave propagation problem, where the shock wave is induced by spherical charge in an unbounded space. Large pressures caused by the explosion are accompanied by permanent volumetric deformations. Suitable mathematical description of the phenomenon requires taking into consideration nonlinear physical properties of the soil as well as geometrical nonlinearities. This leads to a number of difficulties during the formulation and solution of the problem.

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The basic equations are introduced applying the methods of the continuous medium mechanics and G. M. Lachovs constitutive equations for a 3-component soil: quartz+ +water+air. In the present model incompressibility of the soil in the unloading zone is also assumed.

In the first part of the work the basic equations describing the problem were formulated. In the second part the approximate solution method was proposed to avoid the necessity of solving of the nonlinear partial — ordinary differential equations. The results of the numerical calculations are presented in the form of the nomographs, where the relations between chosen nondimensional parameters were determined.

The nomographs allow to evaluate the magnitude of the compact zone and the mean degree of the soil compacting in the area. An evaluation of the efficiency of the explosive compacting of the soil was also given.

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