

Problems of the theory of the consolidation solved in the special functions

Azhibek DASIBEKOV¹, Azimkhan ABZHAPBAROV¹, Peruza DUISEBAYEVA¹, Aigul POLATBEK¹

¹ *M. Auezov South Kazakhstan State University, Kazakhstan*
E-mail: dasibekov@mail.ru, azeke_55@mail.ru, peruza_69@mail.ru, padisha66@mail.ru

Abstract: The soil, which deformation modulus is continuously increased with depth is called continuously heterogeneous. In this paper, this heterogeneity is presented in the form of:

$$E = E_m(\alpha + \beta z)^m \quad (\alpha > 0, E_m > 0, \alpha + \beta z > 0),$$

where E_m, α, β, m are experimental parameters.

On the basis of this dependence the consolidation problems of elastic and elastically creeping inhomogeneous soils are solved in relation to the restricted area of the consolidation. These solutions make it possible to calculate the values of the pore pressure, the amount of the main stresses and vertical displacements of upper surface points of the condensed inhomogeneous soil mass.

In these solutions for highly compressed water-saturated clay soils is also taken into account that at the initial time the part of loading, instantly enclosed load q to the soil which is equal in value of the structural strength of the compression p_{str} , is immediately perceived by a matrix. In addition, Darcy's law is broken, i.e. the initial gradient of pressure is considered. The resulting calculation formulas are presented as a combination of Bessel functions of the first and second kinds. Taking into account that currently one can define any values of the Bessel functions, it is possible to calculate the pressure in the pore fluids and predict the speed of sediments of the compacting mass [1-4].

Keywords: soil, consolidation, stress, deformation modulus, pore pressure

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