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Vladimir I Andreev

NRU MGSU, Russia

Stress state of a soil array at break of the pipeline

The rupture of water and sewer pipes leads to numerous accidents (subsidence, swelling, etc.). This is especially characteristic for clay, loess, peat and other soils. We consider the stress state of clay array at different models on fluid propagation from a fracture site. Accordingly, the problems are solved in cylindrical and spherical coordinates. The problem is solved by the methods of stationary and non-stationary moisture elasticity. The feature of the calculation is the accounting of the inhomogeneity of the clay during moistening. Figure 1 shows the dependence of the clay deformation modulus on moisture. Depending on the depth of the pipe where the fracture occurred, the ground pressure can be considered axisymmetric (large depth) and non-axisymmetric (small depth). Accordingly, one-dimensional and two-dimensional problems of moisture elasticity are considered. Analytical and numerical-analytical solutions are obtained. An analysis is made of the convergence of the Fourier series as a function of the number of terms in the series. As a result of calculations, it was found that taking into account the inhomogeneity caused by the change in the deformation properties of bodies leads to a significant change in the stress state of bodies compared to the calculation of homogeneous bodies. In clay soils, against the background of a marked reduction in the peaks of compressive stresses, the most dangerous maximum tensile stresses for a cylindrical model increase by 53%, and for a spherical stress increase by 38%.

Recent Publications

1. Andreev V I and Avershyev A S (2013) Elastic-plastic equilibrium of a hollow cylinder from inhomogeneous perfectly plastic material. Applied Mechanics and Materials 405-408:3182-3185.
2. Andreev V I and Avershyev A S (2013) About influence of moisture on stress state of soil taking into account inhomogeneity. International Journal for Computational Civil and Structural Engineering 9 3 14-20
3. Andreev V I and Avershyev A S (2014) Nonstationary problem moisture elasticity for nonhomogeneous hollow thick-walled sphere. Advanced Materials Research 838-841:254-258.
4. Andreev V I and Avershyev A S (2015) The Stress State in The Rock Mass Exposure to Moisture and Temperature Fields. Procedia Engineering 111:30-35.

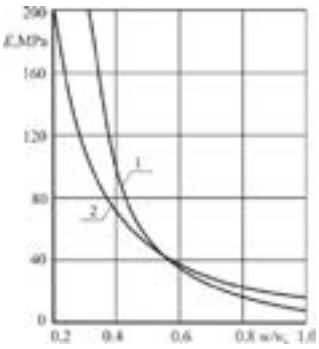

Figure 1: Dependence of the soil deformation modulus on moisture:1-loam and clay; 2-sandy loam.

Biography

Vladimir I Andreev is a Head of Department Strength of materials at National University Moscow State University of Civil Engineering. He is also an Professor, Doctor of Technical Sciences, full member of the Russian Academy of Architecture and Construction Sciences (RAASN), a member of UMO universities of Russia for education in the field of construction. He is an Honored Worker of Higher School, member of the Russian National Committee on Theoretical and Applied Mechanics and Honorary professor at the Warsaw University, honorary builder of Russia.

asv@mgsu.ru