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# Numerical analysis for stress-strain state of an earthfill dam under seismic impact



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Design and construction, as well as the reliable and safe operation of hydraulic structures (earthfill dams) in seismic regions of the republic, requires the solution of tasks related to quality improvement of their design methods for various types of loads, both main ones (gravity forces, hydrostatic forces, etc.) and load combinations (seismic). A mathematical formulation for the solution of static and dynamic tasks in the elastic state is proposed for the planarly deformed state of the earthfill dam. The solution method and algorithm are described. Design method of dynamic characteristics is proposed on the example of an earthfill dam (in operation for over 30 years) with the account of structural features and actual piecewise inhomogeneous physical and mechanical properties of soil in the structure (presented by design organization). The solution of the task is carried out using the numerical finite element method. With the use of the developed method, the solution of dynamic task is brought down to determining natural frequencies and vibration forms. For the reliability of obtained results, natural frequencies are compared to similar problems. The dynamic test results are the produced natural forms of earthfill dam vibrations, according to which necessary analysis of behavior was given. The formulation of the task on earthfill dam dynamic behavior is proposed for external impact in the form of horizontal nonstationary seismic impact. At the same time, the stress-strain state of the earthfill dam has been studied. The results are relationships for

displacements (horizontal, vertical), normal and tangential stresses in the earthfill dam. Corresponding analysis of the dynamic behavior of the earthfill dam was done under shear impact. The results of the studies gave corresponding recommendations.

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## Topics

[Finite-element analysis](#), [Hydrostatics](#)

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