UTILIZATION OF ULTRASONIC MODELLING PROCEDURE FOR STUDIES OF SEISMIC PROCESSES IN NON-UNIFORM ROCK FOUNDATIONS OF DAMS

by

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The evaluation of seismic stability of high-head dams in mountain regions requires the knowledge of the distribution of seismic accelerations, stresses, etc. in non-uniform massives of dam foundations, canyon edges and in the body of rock-fill dams, under earthquakes.

As distinct from computerized mathematic modelling of seismic processes in the rock massives which present difficulties in calculating the pulse fields for random non-uniform media, unlike the detailed prototype tests which necessitate complex devices operating for a long time in a waiting regime, the above information with an appropriate reliability and lower operational costs may be obtained by ultrasonic modelling procedure. The following procedures were developed and tested at the B.E. Vedeneev All-Union Research Institute of Hydraulic Engineering: construction of rock foundation for a complex geological structure of a dam body of non-uniform materials; impulsive generation of ultrasonic oscillations in such models and the reception and interpretation of such oscillations.

With the aid of ultrasonic modelling procedure, pulse seismic fields were investigated and quantitative and qualitative characteristics of the fields were obtained, which is advantageous for seismic stability estimations of the Toktogul, Ingury and Nurek hydropower projects. A possibility of utilizing the procedures for investigations of seismic fields with respect to time, amplitudes and spectral composition is also indicated.

1. Rock foundation of a dam of the Toktogul hydropower project constitutes a massive of zonal block composition. By tracing isochrones of the initial approach of the wave front, determined were phase shift in the oscillations of the canyon edges in the dam area, and an intricate shape of the leading edge of the front of oscillations approaching the dam.

2. Studied was the distribution of vibrational amplitudes in the depth and at the surface of a rock massive of zonal composition, cut by fractures and by a system of cracks at the construction site of the Inguri hydropower project.

3. Preformed is a detailed study of the distribution of the vibration amplitudes and the acceleration spectrum on either side of a fracture under a right wing of an Inguri dam and determined is an effective depth of closure of the fracture by concrete.

4. Investigated is the distribution of vibration amplitudes at a body of a rockfill dam of the Nurek hydropower plant, particularly at its watertight core at different levels along the dam height.

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