

Finite Element Model of Kurpsai Dam in Kyrgyzstan Based on Actual Response Measured by Extensive Network of Various Sensors

Shakhzod Takhirov¹, Sagynbek Orunbaev², Elyor Toshmatov³ and Ravshan Shamansurov⁴

¹ University of California - Berkeley, 377 Davis Hall, Berkeley, California, 94720, USA, takhirov@berkeley.edu; <https://ce.berkeley.edu/>.

² Central Asian Institute of Applied Geosciences, Timur Frunze Rd.73/2, 720027 Bishkek, Kyrgyz Republic, s.orunbaev@gmail.com.

³ Institute of Mechanics and Seismic Resistance of Structures, Tashkent, Uzbekistan, t.elyor85@mail.ru.

⁴ Sigma Innovative Tech, Yunusabad District, 19th block, 28B, Tashkent, Uzbekistan, shamansurov@rambler.ru.

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The paper presents recent results of ongoing collaborative research project focused on modelling Kurpsai water dam in Kyrgyzstan. The research team includes scientists and engineers from USA, Kyrgyzstan, and Uzbekistan. This water dam was selected for modelling, because of the recent installation of an extensive network consisting of various sensors aimed at monitoring its performance under seasonal changes, ambient vibration, and seismic excitation. The installed instrumentation network includes the following sensors: (1) a set of fibre-optic strainmeters and temperature meters, (2) a set of velocimeters for seismic monitoring, and (3) a set of GNSS receivers to measure absolute static displacements. A 3D model of the water dam was generated based on utilization of the finite element approach. As a starting point the water dam's concrete was assumed as elastic material. The latter assumption is considered acceptable, because (as of today) only responses to relatively small excitations were measured by the sensors. The actual responses of the dam were compared to that of the finite element model to achieve close correlation to each other. Resonant frequencies of the water dam and its vibrational modes were estimated from the model. In the next phase of the project, the research team is planning to update the geometry of model based on laser scanning to be conducted this year. Local anomalies (bulging areas, cracks and so on) of the water dam will be studied via analysis of point clouds collected by the laser scanner. The fully developed model will be used in extensive numerical study to predict the dam's performance and its response to strong seismic events and other hazards.