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DYNAMIC (PHYSICAL AND MECHANICAL) CHARACTERISTICS FINDING OF THE KAPSHAGAI HYDRO POWER PLANT (HPP) LAIR DAM IN DIFFERENT BURIED LEVELS

Kapchagai HPP, located 70 km north of Almaty for the territory of Almaty region, is one especially important object, which plays an important role in providing the Republic of Kazakhstan with electricity. On the other hand Kapchagai HPP is located in seismic hazard region and represents a serious potential threat to dense populated country sides Ili and Balkhash regions of Almaty region, crucified annex to the north of it. Therefore, stable operation of the object at a strong earthquake is critical, both for the stability of the economy, and for the preservation of human life.

Modern seismic activity area surrounding the Kapchagai HPP was studied based on observations of a network of stationary seismic station since 1951. In the area bounded by the coordinates 43 ° 20'-44 ° 20 'N and 76 ° 30'-77 ° 30 'E. for the observation period from 1951. Recorded 237 earthquakes, including the most powerful - Bakanasskoe 25 September 1979. With K = 14 and 23 August 1960. With K=13. Up to 1969. Recorded two earthquakes with K = 11 (in 1955 and 1956) and five earthquakes with K = 10. May 1, 2011 on the shore of Kapchagai water storage basin earthquake with K = 13.

Program of work, the organization length is optimal (at least two years) seismic and seismic observations to track the activation of local seismogenic structures, refine the projected seismic effects on objects Kapchagai, as well as studies of the dependence of the seismic regime of exploitation Kapchagai [1-6]. In addition, provides a large amount of seismic surveys to determine the parameters of dynamic dams and outcrop (shear modulus, Poisson's ratio) needed for calculations of seismic stability of waterfront facilities.

Kapchagai HPP consists of:

• riverbed and den dams built of alluvial and aeolian sands;

• rocky outcrop, in which body to tunnel conduits;

• the power house and other auxiliary facilities.

Comprehensive studies have been carried out:

• assessment of seismic hazard in the region;

• geophysical field investigations;

• having a technical state of the structure using geophysical methods, mapping diving underwater structures, determining the strength characteristics of the material structures;

• cash-parametric analysis;

• Model tests of the dam.

Large body of seismic to identify changes the rate of passage of longitudinal seismic waves at different levels in the depth of the body of the dam to determine the dynamic parameters of the dams (shear modulus (***E***), Poisson's ratio (***?***)), necessary for the subsequent calculations. Seismic surveys were carried out on the profile of seismic inversion method for stationary and mobile source point fluctuations. Seismic vibrations excited by the shock method (rapid lowering bucket tractors "Belarus") in increments of 2 m from the experimental work directly determined wave velocities V_p. S-wave velocity V_s determined from archival and published sources.

Changes in P-wave velocities V_p with depth, calculated refragiravian-refraction are shown in Figure 1. They differentiate significant for different soils.

a) b)

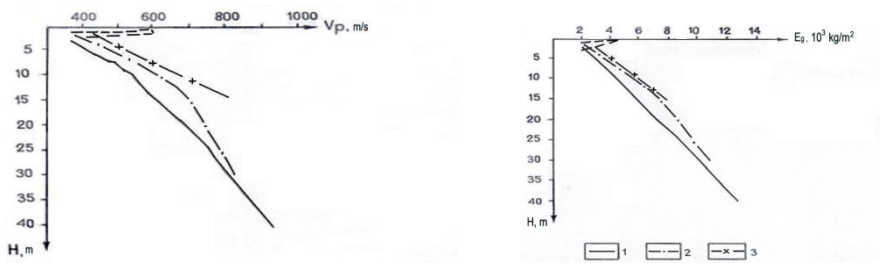

Fig. 1. Graph of the depth of the dam: a) wave velocities, and b) the dynamic modulus of elasticity (1 - sandy-loamy soil grussy (comb);2 - grussy sandy soil (berm);3 - rock mass (blowing hard prism)).

Dynamic parameters ***? (Poisson's ratio)*** and E_g ***(Dynamic elastic modulus)*** is given by:

a) $\mu = \dfrac{1 - 2\dfrac{V_S^2}{V_p^2}}{2\left(1 - \dfrac{V_S^2}{V_p^2}\right)};$ b) $E_g = pV_p^2\left[\dfrac{(1+\mu)\cdot(1-2\mu)}{(1-\mu)}\right]$

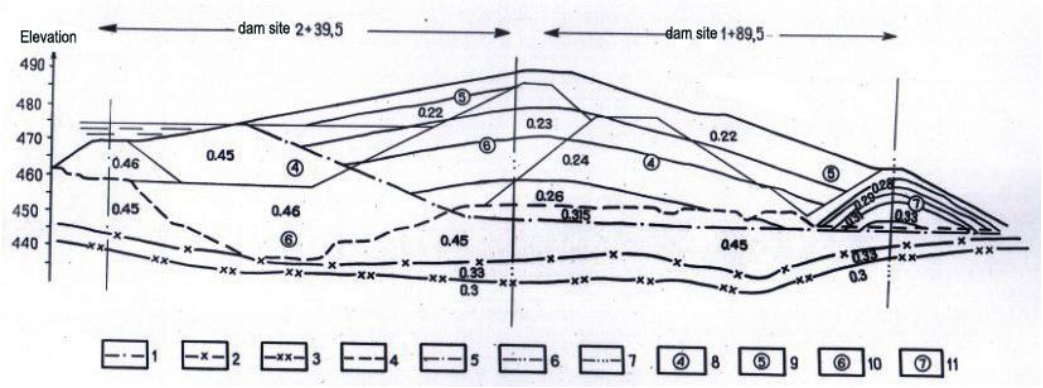

Fig. 2. Distribution of values of $\mathbf{V_p}$ in the body of the dam's Lair. $V_p = 0.45$; $V_p = 0.22$; etc.
1 - depression curve 2 - the bedrock surface, 3 - surface undisturbed rock, 4 - the dam, 5 - axis riding hard prisms, 6 - axis of the dam, 7 - axis downstream hard prisms, 8 – lumber -gravelly soil, 9 - Aeolian sand, 10 - sandy loam and sandy soil, 11 - rock

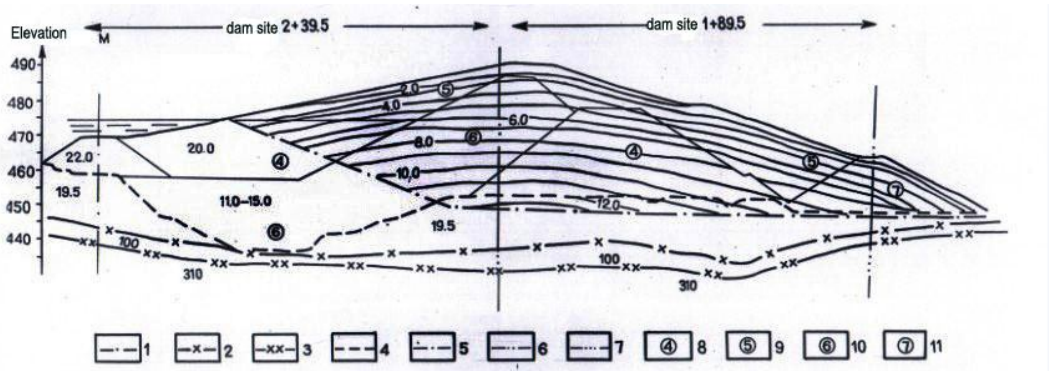

Fig.3. Distribution of values of **?** in the body of the dam's Lair. ? = 2.0; ? =15.0; etc.

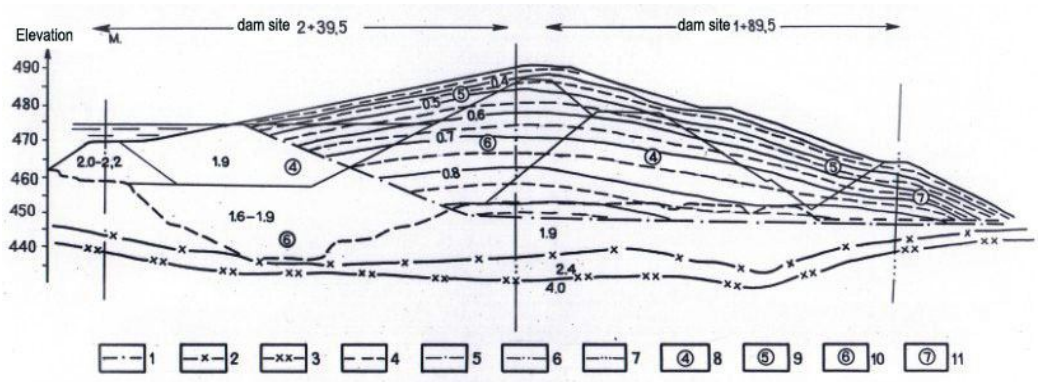

Fig. 4. The distribution of values in the body $\mathbf{E_g}$, 10^3kg/m^2 Lair dam. E_g=1.9; E_g=0.7; etc.

Figures 2-4 are the final data on the distribution of the parameters $\boldsymbol{V_p}$, ***?***, $\boldsymbol{E_g}$ river bed in the body and den Dam, which are then used to calculate seismic structures.

Such work has been done for the riverbed hydroelectric dam.

CONCLUSIONS

Based on the processing and analysis of materials on recent tectonics and seismic engineering materials revealed that in an area of hydropower facilities Kapchagai forecast strong ground shaking is less than 8 points on the MSK-64 scale.

For the calculation of seismic objects waterfront Kapchagai HPP experimental distribution of Vp in the dam body and on this basis calculated the values ? and Eg. In calculating the river bed and den dams were considered the experimental data. The calculation was carried out for different levels of water content - NEC (retaining regulatory levels) according to standard procedure and the method of wave theory.

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Резюме

Қапшағай СЭС ғимараттары мен имараттарына қатысты жасалған күрделі ғылыми зерттеу жұмыстардың негізінде, сай бөгеті имаратының нақты динамикалық (физика-механикалық) сипаттамалары зерттеліп анықталды.

Резюме

В результате проведенного объемного научного исследования зданий и сооружений Капчагайской ГЭС, были исследованы и определены точные динамические (физико-механические) характеристики логовой плотины.

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Received 05.10.2012