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HYDROTECHNICAL STRUCTURES, THEIR RESEARCH, DESIGN, CONSTRUCTION AND OPERATION

M. Kh. Rajapbaev

Senior Lecturer Tashkent Institute of Irrigation and Agricultural Mechanization Engineers-National Research University, Uzbekistan

ABSTRACT: In this article, the purposeful use of hydrotechnical structures, the study of leveling works based on the height of the reservoir dam into classes, the creation of the transverse profile of the dam, the creation of the scheme of the base leveling road in the reservoir area, the study of the water level in the reservoir into different levels, the planning of water supply networks and the Jizzakh reservoir the problems of studying the horizontal movement and vertical subsidence of the structures according to the general procedure are described.

KEYWORDS: Reservoir, dam, leveling classes, soils, profile, irrigation networks, rappers, relief, earthen dams.

INTRODUCTION

Hydrotechnical structures are structures designed to use natural water resources (rivers, lakes, seas, groundwater) or to prevent (reduce) the harmful effects of water on the environment (floods, coastal erosion control, flood protection, etc.). Certain water management activities are carried out with the help of hydraulic structures. Also, the creation of reservoirs, water flow and level, as well as ice and sediments are regulated.

Hydrotechnical structures are built for different purposes and in different natural conditions. According to the type of water flow or reservoir, they are divided into river, lake or pond, intra-system or network (hydraulic systems) and underground network structures that regulate and transmit water (siphons, pipes).

According to their purpose, hydrotechnical structures are divided into general and special structures. General-purpose structures include water storage, water supply, water discharge and regulation structures, used to ensure the capacity of water and reservoirs needed for various sectors of the national economy, to pass the estimated water flow and similar purposes.

Special facilities are designed for reclamation (canals, pumping stations, etc.), irrigation of fields. According to the conditions of use, river hydrotechnical structures are divided into permanent hydrotechnical structures, which include dams, canals, collectors, tunnels, pumped power stations and buildings, hydroelectric power stations, etc.

The problem. Hydrotechnical structures are built in hot climates and harsh winters, in different hydrological and geological conditions, in regions with high seismicity. This requires an individual approach to the design, construction and operation of hydraulic structures, careful consideration of all local conditions.

In the design of hydrotechnical structures, it is taken into account that large hydrotechnical structures are extremely responsible and that a serious accident of a large-scale water-storing structure will have very serious consequences, not only as a result of the failure of the structures, but also with human and material damage. It results in destruction, flooding of settlements, industries and downstream transport links.

Therefore, systematic geodetic observations are carried out during the operation of hydrotechnical structures, especially reservoir dams. Information on the movement of the points of their structure most fully and accurately describes the results of its interaction with the foundation and the external environment.

The horizontal displacements of the dam crest points characterize the static performance of the entire structure, including the foundation. During the operation of the dam, horizontal movements occur mainly under the influence of air temperature and hydrostatic head. Studying this process with geodetic methods will lead to its safe operation. Research in this regard is detailed in the third chapter of the thesis.

Dams built from soil as a construction material are called earthen dams. Earth dams can be used in many geographic areas. The soil laid on the body of the dam does not lose its properties over time. Ground dams can be installed at almost any height, all processes of their construction are highly mechanized. Along with the advantages of earthen dams in this regard, there are also their disadvantages, which are as follows:

- limitation of maximum discharge possibilities through the top of the dam;
- the presence of filtration flow in the dam body creates potential conditions for filtration deformations;
- if the body of the dam is made of soils with high water permeability, there is a possibility of a large loss of water for filtration;
- uneven location of the dam along its transverse profile;
- the presence of restrictions on the use of certain types of soil.

According to the method of operation, earthen dams are divided into dry-filled dams, alluvial dams, and dams built with the help of directional explosions.

Analysis. According to the construction of the shell and waterproofing devices, dams are distinguished from homogeneous and homogeneous soil with a surface made of non-soil material and a diaphragm made of non-soil material.

With measures, the dams are separated by means of a waterproof device at the base.

Dams are divided into four classes. The class is determined by the height of the dam, the nature of the foundation soil. A dam constructed of earth materials, coarsely fractured with sandy, solid or semi-solid foundations, structure height:

- > 75 m - I-class;
- 35-75 m II class;
- 15-35 m III class;

- < 25 m - IV class.

When choosing a dam site, its condition is influenced by various factors. Topographic conditions determine the length and height of the dam. The dam area, as a rule, has the narrowest part of the water flow, which is usually typical for the area, which ensures the minimum volume of work. Engineering-geological and hydrological conditions, which are assessed by soil strength properties, their layering and water permeability, play an important role. The location of the dam is selected at the same time as monitoring the spillway project.

Several adaptations are determined during the research process. The location of the future dam is chosen taking into account the omission of construction costs. Availability and feasibility of road network construction, power line laying and feasibility studies of options will be considered.

For the adopted leveling, a cross profile is made of the ground surface with pickets and fixing marks at intermediate points. The shape of river valleys is also taken into account when designing dams.

In mountainous sections of rivers and small streams, the cross-section has a shape close to a triangle (gorge) and there are no floodplains.

In reservoirs created with the help of earthen dams, water is divided into three levels:

- on the level of mandatory retention;
- on normal maintenance;
- by dead volume.

The markings of these levels are set using water management calculations. The cross-sectional shape of an earthen dam is a trapezoid, the larger side of which is called the ground, and the smaller side is called the crest. A cross profile of the dam is shown in Figure 1. The floor of the dam is not always horizontal, its contour depends on the terrain.

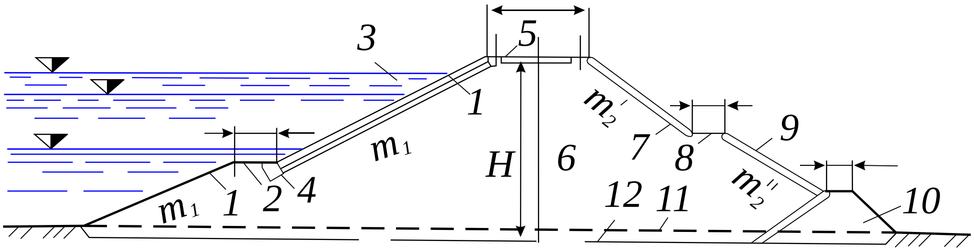


Figure 1. Cross profile of an earthen dam

1, 7-upper and lower slopes; Fixing the upper and lower slopes of the 3.8 stream; 2- berm of the upper slope; 4- stop part of fastening; 5, 6, 12- top, body and base of the dam; 10th drainage; 11-natural ground surface.

Ground dams are built on any rock and non-rock foundations. The soil of their foundations is placed on the basis of the same requirements as the soil of the dam body. Their design characteristics are determined on the basis of experimental studies through statistical processing. Materials of engineering-geological studies are carried out using formulas for pre-calculation of settlement, based on the theory of soil consolidation.

A dam is a very important structure, and its failure can lead to increased flow of water or flood and have disastrous consequences. Therefore, during its construction and operation, regular geodetic observations are carried out to check its subsidence and horizontal displacements. The correctness of theoretical calculations and the prevention of possible accidents, and information on the movement of points of the structure fully and accurately describes the results of its interaction with the foundation and the external environment.

The horizontal displacements of the dam crest points characterize the static performance of the entire structure, including the foundation. During the operation of the dam, horizontal movements occur mainly under the influence of air temperature and hydrostatic head, the study of their flow by geodetic methods helps its safe operation. In the course of the research, sufficient research was carried out to organize and carry out full-scale systematic monitoring of subsidence and horizontal displacements of structures in Jizzakh reservoirs, analysis of the obtained results and assessment of their condition.

Reservoirs, while regulating river flow, simultaneously intercept major water and silt flows, impounding solid currents and altering the hydrography. This is a graph of flood (water) flow rate versus time for a flood, where flow rate represents the volume of flood (water) that has passed through the moving part of the stream per unit time. The surface of the valley becomes the bottom of the reservoir under the flood and is completely or partially excluded from the national economy.

Result. Regulation of the flow of rivers in the territory of the Republic of Uzbekistan, 89-96% of its average annual volume corresponds to April-May. The purpose of a water management calculation may be to determine the useful volume of a reservoir for a given water yield and the availability for a given control volume. Flooding can be permanent or temporary. Permanent - the flood is called permanent, from which the earth will never be free.

Temporary - inundation of land by flood waters for a short period of time. They are of such duration and frequency that the flooded land area can be used in a planned way.

Temporary floods extend from the permanent flood limit to the maximum flood limit.

When building a dam on a river, the amount of flooding depends on its height and the topography of the river valley.

The size of the flood and its consequences for the national economy are becoming one of the most important issues in the planning of hydrotechnical construction, especially in the conditions of the use of lowland rivers.

The design and subsequent construction of structures in the reservoir imposes high requirements on the accuracy of height justification, because the structures are designed for the entire reservoir area, and then the structures are installed in height, connected to each other (Fig. 2).

Figure 2 shows typical layouts of leveling passages to create a reservoir. In the first of them, leveling crossings of class I and II, included in the state leveling network, cross reservoirs in a transverse direction.

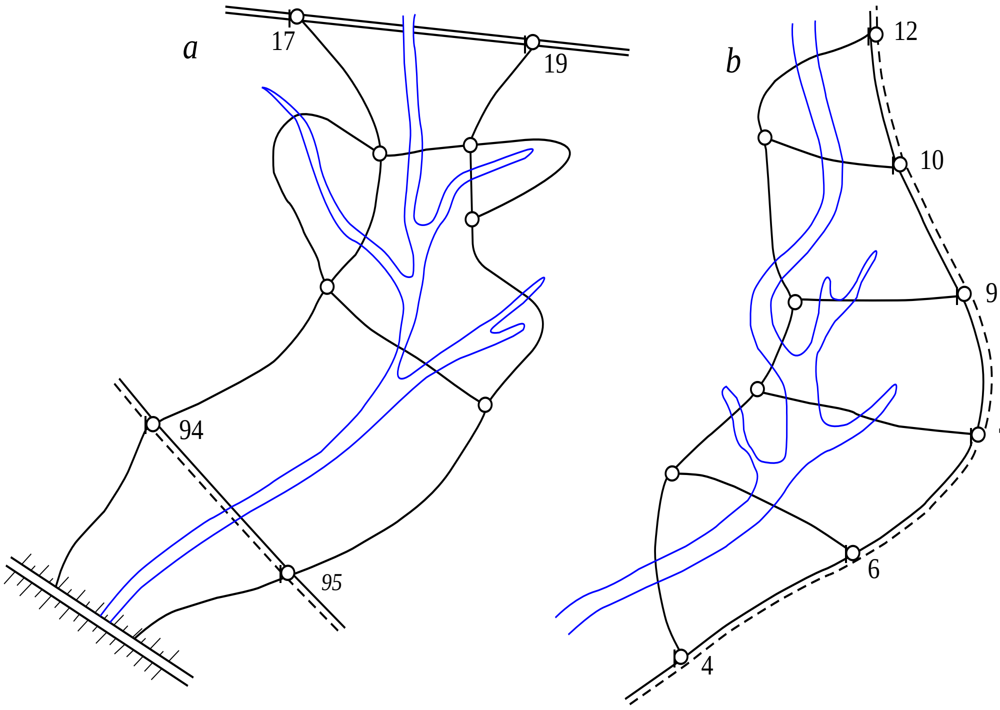


Figure 2. Base level road scheme of the reservoir area

a - the first type, b - the second type.

The following should be projected on a map of the same scale for the entire territory of the reservoir:

a) determining the capacity of the reservoir;

b) determination of flood and flood boundaries;

c) planning of earthworks in different regions.

All irrigated massifs in the territory of the Republic of Uzbekistan can be conditionally divided according to the nature of the relief and slope of the earth's surface: mountain, sub-mountain, valley, plain and delta (Fig. 3).

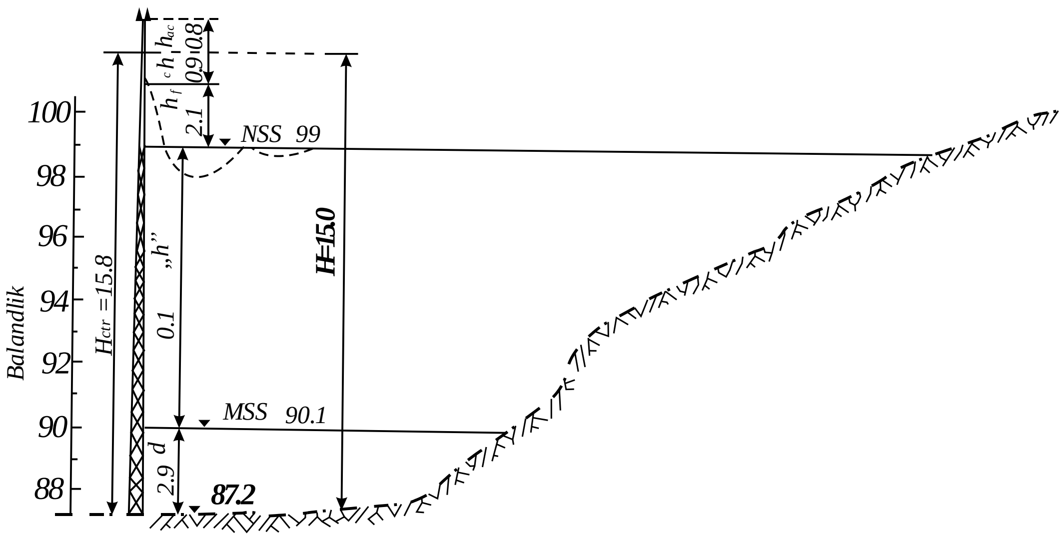


Figure 3. The level of the water level in the reservoir

Based on the above elevation levels, the relief mainly determines the height and plan condition of the canals, and the geological and hydrogeological characteristics determine the feasibility of constructing a canal along the selected route (Fig. 4).

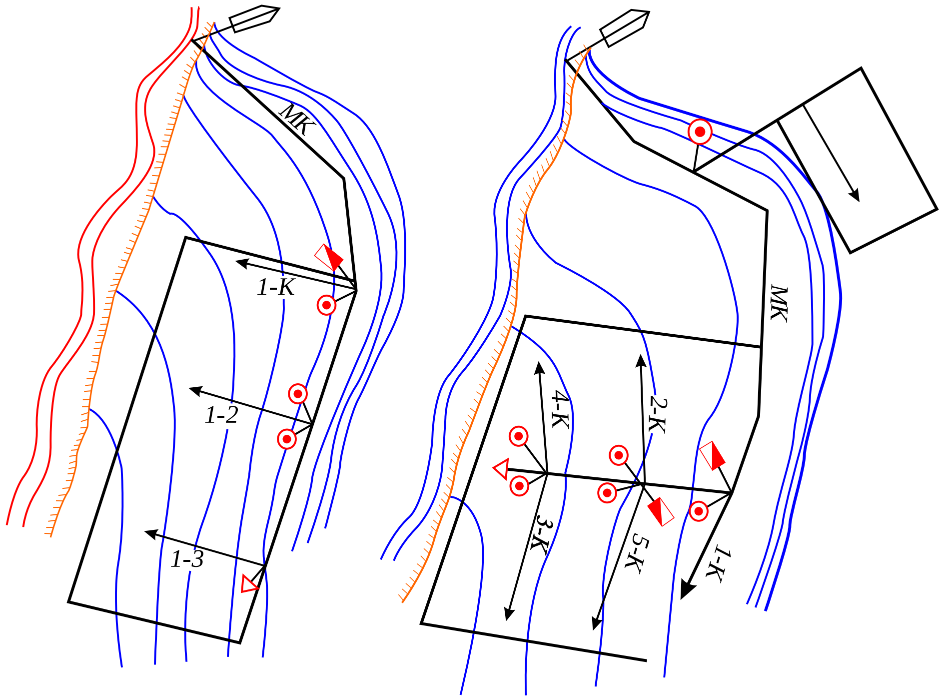
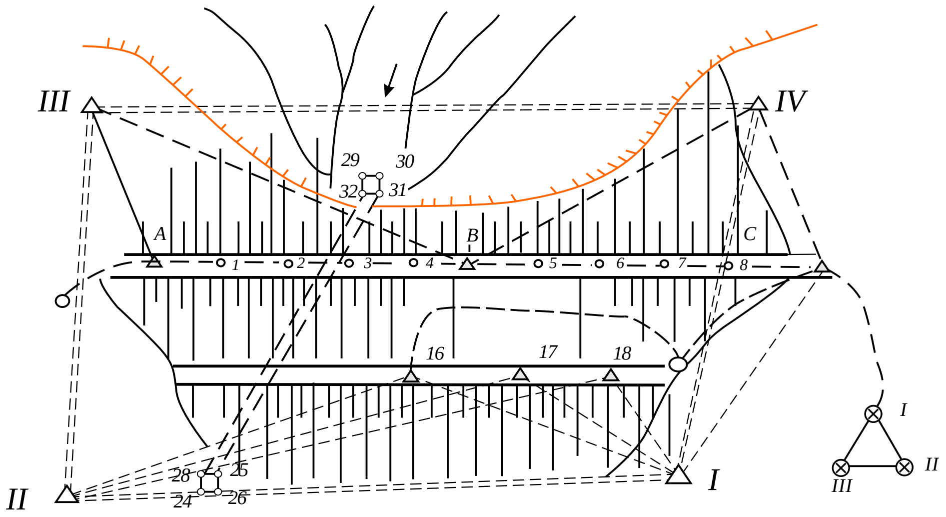


Figure 4. General schemes of irrigation networks

During the research, a lot of experience in organizing and conducting scientific, production and scientific-research engineering-geodetic works on the design, construction and use of large hydrotechnical structures was studied. At the same time, the organization and conducting of full-scale geodetic observations, processing and analysis of the obtained results and, on this basis, developing recommendations for the safe operation of similar hydrotechnical structures are of great economic importance.

According to scientific research carried out in the Jizzakh reservoir for several years during the research, the horizontal displacement that may occur during the subsidence of the hydrotechnical structure by geodetic methods was fully observed (Fig. 5).



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5- fig. General procedure for the study of horizontal displacement and vertical subsidence of Jizzakh reservoir structures

To monitor the subsidence and horizontal displacements of the underground dam with a height of more than 65 m, monitoring and measuring equipment was installed on the reservoir structures according to the scheme shown in Fig. 5.

These observations began in 2020 and continued until 2023. Observations were made three times a year, during the first half of May during the maximum filling and in late September and early October during the minimum water level in the reservoir.

According to the results of the observations, reports were prepared that analyzed the planned and height shifts of the points of subsidence and the displacement graphs of the observed points and compared them with the data obtained in the previous period.

Conclusion. Based on the indicators of the dam, when the height of the dam is 100 m or more in stony soil, it is classified as I-class of structures, when it is in the range of 70-100 m, it is classified as 2- class of structures; As a result of research, it was determined that when it is in the range of 25-70 m, it is divided into the 3rd class of structures, and when it is less than 25 m, it is divided into the 4th class of structures.

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