Current use of water intake structures of reservoirs

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Abstract. The detailed study of the flow of water in this area is of great importance in designing the sub-surfaces of the drainage and drainage structures of hydraulic structures. In particular, the complex processes associated with the flow of water in the lower and lower reaches of reservoirs of low and medium size play an important role in the choice of appearance, constructive elements and their shape, size and location.

1. Introduction

The detailed study of the flow of water in this area is of great importance in designing the sub-surfaces of the drainage and drainage structures of hydraulic structures. In particular, the complex processes associated with the flow of water in the lower and lower reaches of reservoirs of low and medium size play an important role in the choice of appearance, constructive elements and their shape, size and location. It should be noted that the current flowing into the lower case of the structure has a high energy and destructive ability. Therefore, suppressing its excess kinetic energy increases its safe operation and lifetime.

2. Methods

Experimental studies show that the absorption of current energy is between 60 and 70% [5].
Increased water flow absorption, improved hydraulic conditions of the lower beaches, elimination of general and local wastewater in the lower beaches, the flow of water in the water borehole to the surface superficial in the riser, to minimize or even eliminate flow bubbles. Ceiling, waterproofing walls, pillars, drafts, fluxes, or spreading walls will be designed.

3. Results and discussion

The results of effective studies in this area have been reported in several technical [1, 2, 9].

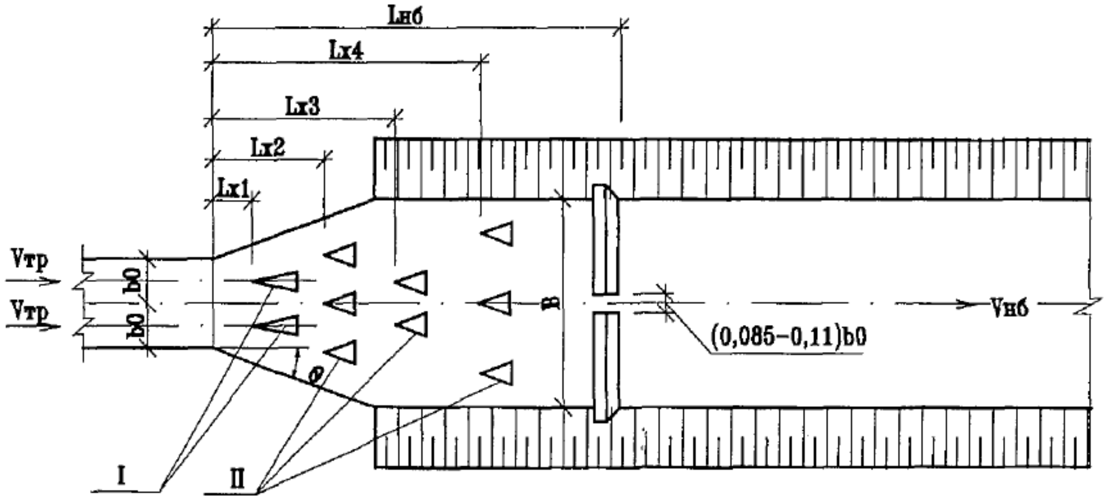
The these energy extinguishers should meet the following requirements:

- Maximum speed suppression of the flow of water from the wellhead to the bottom of the stream;
- Changes in the vertical velocity distribution divergence along the surface of the leaflet due to the decrease in velocity in the booklet and the transition to the surface mode where the main flow rate is observed on the surface;
- hydraulic jumps at compressed cross section due to the increase of water discharge levels of energy suppressors;
- low flow distribution;
- decrease in flow fluxes due to the distribution of energy in the sealed area of hydraulic structures;

As a result, the effect of these energy absorbers on the stream simplifies the design of the structure, reducing the discharge or discharge of the water, improving the hydraulic conditions [10].
The effect of energy extinguishers on the low beams of low- and medium-sized reservoirs can be divided into three types [17]: reactive 1; 2nd dissipation and 3rd distributor.

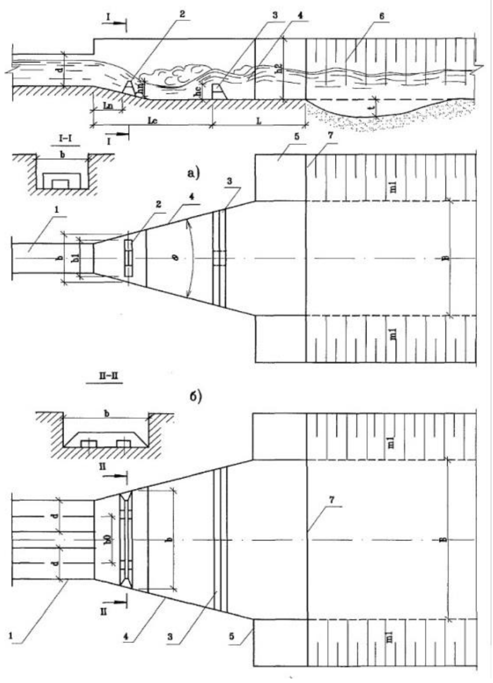
1. The energy quenching forces reaction forces in the opposite direction to their movement when the current hits them. This reaction force is added by hydrostatic pressure (with the opposite sign), and the resulting hydraulic jumping is performed at smaller values than the coupling depths determined by applying hydraulic jump equations [7] for smooth hydraulic smooth tubes in classical hydraulics. This is the essence of the reactive effect of the energy-absorbing hydraulic leap in the case of the high-water mark of the water borehole [8]
2. Energy the length of hydraulic jumps as a result of the reactive effects of the quenchers

This is a major factor in determining the length of the wellhead. Examples of such power exchanger designs are shown in Figures 1.1 and 1.2.
As we know, the dissipative effect of energy absorption on water flow is influenced by an increase in the absorption of current energy. The water quench wells and the power exchanger installed in the booklet form additional circulating areas of the water, with velocity gradients in these areas having high values [13].
This condition increases the turbulence of the flow and increases the pulsating voltage of the frictional flow, and the excessive absorption of kinetic energy. This process releases large-scale rotations and causes the flow turbulence to quench. The area after the hydraulic jump is reduced in length and reduces local washes. The effective suppressors for the dissipation effect are water-shaped, dashed and toothed pillars, which additionally distribute the stream to several streams and increase the surface of the dividing surface.
Managing the flow of water in a hydraulic facility with a moving barrier - the shunting energy extinguisher plays an important role. At the same time, the extinguisher adjusts the flow rate of the inflow water towards the water surface, and the flow flowing downstream changes the surface behavior. It redistributes the flow rate, transfers most of the surface to the surface, and decreases the rate of river flow. In addition, the direction of flow of water flows in the plan. As a result, there is a decrease in the velocity of water flow near the bottom of the river.
As a result of maneuvering of moving obstacles, upstream currents occur in a plan characterized by uneven velocity distribution [4].
Installation of power suppressors will increase the flow on the plan and result in a uniform distribution of speed. The water injection well's capacity is increased, which results in increased transit flow stability and decreased flow rate [14].
NR Rozanov [12], who carried out a number of experimental studies on hydrotechnics in the former Soviet Union, recognized the feasibility of constructing hydraulic jump wells, walls, columns, etc.).
NF Rozanov [12] outline curve for the bottom line of the borehole drainage wall. , 12, and 1.06 times larger, he said. In the plan, it is observed that the flow distribution behind the linear wall of the water line is 1.3 ... 1.4 times greater than that of the above-mentioned structures.



Picture 1.1. Design of anti-floating, checkered, and overflow streams in the lower beams of reservoirs designed by Professor NP Rozanov.

N.T. Kaveshnikov [6] developed his own design for the cases of one- and two-tube tubes in the lower shelf of a water reservoir. This design was tested in a washable experimental model (Figure 1.2). This proposed design is not considered effective for open water discharge structures, although it provides the second hydraulic jump in the flow state - regime change [11].



Picture 1.2. The lower beam design of the reservoir drainage system recommended by NK Kaveshnikov: a) 1-pipe; b) 2-pipe.

Research work carried out by experts of design and research institutes for different regions to study deformation or washing processes in buildings, and their causes of hydraulic designing and calculations, which are currently in use during the operation of waterworks hydraulic structures. and observational studies and archival materials].

A number of scientific studies have been conducted in recent years to study this issue, as well as the existing pipe structures in existing reservoirs in the country.

The results of these studies and the results of scientific research can be summarized as follows: For most of the buildings built over the last 50-60 years, the effect of the structure on the flow dynamics has increased dramatically as a result of increased kinetic energy. The change results in increased deformation processes. Cases not taken into account in the design, construction and operation processes, drastically altered hydrological flow rates, errors in the operation process, damages of the side walls, bottoms, power outlets and other structural elements in the lower reservoir. These cases account for about 15-20% of the total number of buildings in the country (Figures 1.3, 1.4).

Hydraulic structures of this class, providing operation of complex hydromeliorative system of the republic, require annual repair of 40-50% of facilities. It should be noted that the results of various surveys and research show that the main problems are in the bottom surfaces of hydraulic structures

Picture 1.3. Deformation processes in the channel ducts of lower and middle water reservoirs (downstream channel Zang-9 in Surkhandarya region).

Picture 1.4. Disorders in the lower Amu-Zang canal in Surkhandarya region.

Problems caused by the above-mentioned reservoirs and downstream water reservoirs can be distinguished as follows:

- Washing at the end of the reservoir, washing the bottom and the edge of the outlet canals;
- disturbance of noise and adjacent connections;
- failure of the extinguisher;
- Hydrodynamic effects of water flow on the ground and concrete reinforced base areas;
- Various plant growth and fuzzy processes in the outlet.

One of the main reasons for such decay rates is the frequent changes in hydraulic regimes due to hydrodynamic parameters of the outflow downstream due to the dramatic changes in the hydrological regime and the operational conditions of the river as a result of the hydrotechnical impact on the flow rate. can be acknowledged.

Results of the above research and field observations show that hydraulic leakage in water-absorbing structures often occurs in the form of hydraulic jumps in the bottom seams of the outlet structures, which often lead to the process of burial in the lower lane of the structures. This, of course, results in an uneven velocity distribution, a condition of beef interconnection to the surface or combined surface-to-bottom surface, hydrodynamic pressure oscillations, oscillations or long hydraulic jumps. This is especially the case when hydraulic structures are put into operation. This may, of course, be due to some design deficiencies, differences in design and construction, neglect of complex hydrological and geological conditions, poor quality construction or improper operation during operation.

The following disadvantages of low and medium hydraulic structures are based on the results of scientific research on the structure of the substructure of the hydraulic structures:

- lower than required standards of reinforcement work in the lower category;
- small size elements of prefabricated structural elements:
- low coherence of these elements;
- Inadequate processing of slab foundations and their interconnection;
- Absence of energy absorption elements to reduce the kinetic energy of the water flow or improper installation of water flow without taking into account the hydrodynamics.

The requirements for the design and construction of hydraulic structures are not clearly defined by the requirements for the choice of technical and economic options for determining the design and construction of water intake structures, drainage systems, and water injection wells. However, this has not been possible until now. This may be explained by the fact that the hydraulic leakage rate of the outflow structures in the lower beams is not sufficiently studied by the hydrodynamics of the flow forces affecting the elements of the structure during the outer and bottom contact.

As a result of the above-mentioned disadvantages, opening between the elements of the structure causes rotational movement of the watercourse. The hydrodynamic intensity of the slab interval causes an increase in hydrodynamic pressure, and the change in flow hydrodynamics leads to deformation processes. Soil washing as a result of the deformation processes that are followed by the washing of the bottoms under the slab, the horizontal position of the slab and eventually causes the plate to move unstable. This, of course, undermines his account balance. The formation of horizontal force and the sliding moment make the plate move downward. This movement results from the change in velocity and hydrodynamic pressure fluctuations in and out of the slab. This can be considered as a complete breach of the booklet. On the coasts of the facility this can be more complicated. The washing of the ground beneath the coastal slab will cause it to slip and slip along the coast. It is natural that these slabs move along the output channel and cause negative states [15, 138].

These recognized situations require hydraulic calculations to be carried out in the design process, taking into account the effects of hydrodynamic flow rates and conducting research in this area.

4. Conclusions

The study of melioration pipe structures in the lower case of hydraulic structures, the analysis of their performance in natural field conditions and detailed methods of calculating their elements allowed to make the following conclusions:

- Low-grade deformations of the low and medium-sized reservoirs preventing the unstable operation of low-discharge structures for long periods of time lead to the disruption of water-borne wells and reservoir elements.
- Currently, the flow of pipes requires the development of a new generation of water-dispersing devices and energy extinguishers, which prevent flow fluctuations in the lifting and lowering modes, and the beam junction in different situations. At the same time, it is advisable to continue the research in the new system to evaluate the potential of the existing extinguishers for the extending wells.
- There is a need to improve the methods of calculating the length and thickness of water boreholes and bridges in the direction of reliable and stable operation of low- and medium-sized reservoirs.

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