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HISTORY OF CONSTRUCTION OF HYDRAULIC STRUCTURES AND GENERAL CONCEPTS ABOUT HYDRAULIC STRUCTURES

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Abstract:

Our article entitled "A Brief History of the Construction of Hydraulic Structures and General Concepts about Hydraulic Structures" contains historical information about canals located in the geographical areas of Central Asia, their water sources, as well as scientific facts about water supply technology. Storage in these canals, as well as the basics and concepts of the construction of hydraulic structures

Keywords: Construction of hydraulic structures, geographical location of Central Asia, the Amu Darya, Syr Darya and Zarafshan rivers, Ancient Bactria, Sugdiyana, Khorezmian states, Fergana Valley, Dargom Canal, Samarkand, Shahrud Canal, Gaushvar (Gavkhar) Canal, Tuprokkala Canal, Chermen Canal Yab, Girya canal, Toshsak canal.

INTRODUCTION. Most of the land suitable for agriculture, including in Central Asia, is experiencing moisture deficiency, and therefore, since ancient times, people have spent a lot of effort and labor on correcting the imbalance of natural factors and increasing the water content of the land.

As mentioned above, the geographical location of Central Asia, its arid climate, i.e. extremely dry air, hot and rainless summers, wet and cold winters, i.e. the fact that the climate is sharply continental and during this period the vegetation made it necessary to grow crops here under artificial irrigation [3].

METHODS. We studied this research using the methods "Problem Situation", "Venn Diagram", "Brainstorming", "Discussion" and "Project". In this case: through our first method: a problematic issue was identified, the history of its occurrence was studied, the consequences were considered, ways of solving it were considered and determined; the second method was to construct a Venn diagram; Using the following methods, the article shows the current problem, expresses opinions and ideas, and presents specific analyzes and project schedules.

Results and discussion. The history of irrigated agriculture in our country goes back to the very distant past and goes back almost 10 thousand years. In the valley of the Amudarya, Syrdarya and Zarafshan rivers, irrigation and construction of appropriate canals and structures were carried out. According to historical data and the results of archaeological excavations, irrigation work was carried out in Central Asia in the 9th-7th centuries BC. An example of this is that in ancient Bactria, Sugdiyan, the Khorezm state, and the Fergana Valley, irrigation work was carried out, irrigation networks and drainage structures were built [4].

If we look at the Dargoma Canal, built by hand 2500 years ago on the Zarafshan River and preserved to this day, we will see how smart our ancestors were, who knew how to accurately calculate the height and slope of the land. We are sure that this is true. In addition, one can list the ancient and still preserved canals Narpai, Mirzaarik, Shahrud, Vobkent, Pirmast, Sultanabad and many other canals that receive water from the Zarafshan River. The capitals of ancient states were built along canals that received water from the Zarafshan River. The Dargom Canal supplied water to Samarkand (Marokand), and the Shahrud Canal passed through the city of Bukhara. Archaeological studies have shown that the period of the most developed irrigation network in the lower part of the Amu Darya corresponds to the period from the 6th century BC to the 3rd century AD. According to surviving historical documents, Khorezm is the oldest irrigated region with a complex system of hydraulic structures of its time. As evidence of our opinion, we can cite the Goshvar (Gavkhar) canal, built in the middle of the first millennium BC to irrigate the territories from the Amu Darya to the right bank of Khorezm to the heights of Sultaniztog.

In the 1st century AD, a large network was built to irrigate the slopes of Sultaniztog, receiving water from the Tuprokkala canal, the area irrigated from the Ghaznaabad-Chermen-Yab canal expanded, and in the 3rd century Western Kiyat appeared. A canal was built, and in the 4th century, irrigated agriculture began in the oases around the canals of Guldursin and Berkut castles. In the 9th century, agriculture was restored in the lower part of the Gurganj (Old Urgench) and Ghaznaabad (Madra) canals, and irrigation development of the lower delta regions of the Amu Darya began. During this period, the Shavat (Shakhabad) and Bouvet canals were built, and in the 10th century, two branch canals were built from the Khiva canal on the left bank of the Amu Darya.

By the 12th-13th centuries we can witness some revival of irrigation work in Khorezm: the Ghaznaabad (Gazavot) canal through the Chermen-Yab stream was brought to Shahsanam, and the Girya canal to the Kavatkal district. Among the ancient canals we can note the branches of the Toshsaka canal, which is currently the largest canal in Central Asia, as well as the Shavot, Polvon and Gazovot canals, which are still in operation today.

Irrigation systems in the Tashkent oasis were built mainly on the

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Chirchik and Angren rivers. Greek historians claim that large canals around Tashkent existed back in the 3rd-2nd centuries BC.

In the mid-19th century, the Emirate of Bukhara arose on the territory of modern Uzbekistan. There were semi-independent administrative regions that belonged to the Kokan and Khiva khanates; about 3.5 million people lived in these regions. 90% of the population is employed in agriculture - farming and animal husbandry, and the area of irrigated land is estimated at 1.6 - 1.8 million. Thus, in that period the average irrigated land was 0.45-0.5 per capita. Irrigated lands, including orchards, vineyards and farmsteads, gradually developed as a result of the development of dead lands (not yet drained lands) and the release of water into dry lands [5].

In the mid-19th century and later, the priority arrangement of crops grown in agriculture remained the same: grain crops in the first place, horticulture and viticulture in the second, vegetables and sugar cane in third, and vegetables in fourth. In first place are alfalfa and other crops necessary for livestock farming, in fifth place is the cotton harvest. Information about the main large channels in our country is presented in Table 1.1.

Table 1.1. MAIN LARGE CHANNELS OF THE REPUBLIC

Channel names	***Get water source***	***Water flow at the head of the canal, m3/sec***	***Length, km***	***Year of use***	***Area (thousand hectares)***
Shahri Khan	Karadarya	115	114,8	1987	141,0
Andijan	Karadarya	45	81,9	1903	46,7
savvy	Karadarya	25	47,8	1926	18,0
Pakhtabad	Karadarya	30	40,9	1936	17,4
The most sublime	Karadarya	30	190,4	1960	9,7
South Fergana	Shahrikhan channel	100	57,0	1939	75,8
Greater Namangan	Noreen River	61	90,0	1974	24,0
Greater Fergana	Noreen and	150/2134	249,0	1939	263,4
Greater Andijan	Karadarya	200	102,0	1970	70,2
Northern Fergana	Noreen River	113	165,0	1940	74,0
named after Okhunbobaev	Noreen River	80	48,4	1949	36,0
South Mirzachol	Syrdarya	300	124,0	1960	290,5
Left bank – black water	Syrdarya	160	594,0	1922	150,0
Parkent	Chirchik river	57	58,0	1979	40,0
Bozsuv	Chirchik river	290	138,0	1900	99,0
Upper Chirchik	Chirchik river	87	35,0	1943	6,0
Old Tuyaortar	Chirchik river	32	108,3	1912	32,0
Right Bank	Zarafshan River	117	71,4	1930	82,8
I'm sorry	Zarafshan River	120	10,2	1930	9,0
Old Ankhor	Zarafshan River	60	88,0	1973	49,0
Rust	Zarafshan River	85	88,0	1955	49,3
Sherabad automobile channel	Surkhandarya	150	12,7	1970	52,6
Amuzang Channel	Surkhandarya	50	56,0	1973	143,0
Opposite the main channel	Amu Darya	220	86,0	1972	260,0
Amu-Bukhara automobile channel	Amu Darya	300	186,0	1965	250,0
Toshsoka	Amu Darya	480	100,0	1939	300,0
Urgancharna	Amu Darya	35	53,5	1937	9,7
October	Amu Darya	133	54,0	1933	14,0
Kattagore	Amu Darya	75	16,6	1979	9,0
Raushan	Amu Darya	150	43,4	1975	7,9
Amu-Bukhara highway channel Shokhrud branch	Amu Darya	100	11,0	1937	91,7

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Implementation of decisions of the Government of the Republic of Uzbekistan on the safety of hydraulic structures, environmental protection, ecology and socio-economic issues.
The safety of hydraulic structures (as complex natural-technical systems), predicting their future state is a very important, very complex and unique task. Among all the indicators by which GTIs are assessed, the problem of their reliability and safety is the most important. In particular, this is the Law of the Republic of Uzbekistan "On the Safety of Hydraulic Structures" of 1999 and Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 398 of August 20, 1999 "On Large and Particularly Important Water Bodies". Management Objects", the issue became even more pressing with the adoption of the Resolution "On measures to improve reliability during safe operation and use".
The Law "On the Safety of Hydraulic Structures" consists of 15 articles, Article 1 of which describes the purpose of the Law, that is, the design, construction, commissioning, operation, reconstruction, restoration, conservation and completion of hydraulic structures and the relations arising during the implementation of security activities.
Article 2 of the Law is called "Legislative documents on the safety of hydraulic structures", and Article 3 is called "Basic concepts", in which legislative documents on the safety of hydraulic structures consist of this Law and other legal documents. The basic concepts include hydraulic facilities, user organization, emergency situation, declaration of safety of hydraulic facilities, safety criteria for hydraulic facilities, acceptable level of risk of accidents at hydraulic facilities, etc.
Article 4 of the Law concerns the competence of the Cabinet of Ministers of the Republic of Uzbekistan in the field of safety of hydraulic structures, Article 5 concerns the competence of local government bodies in the field of safety of hydraulic structures, and Article 6 is devoted to the topic "State control over the safety of hydraulic structures."
Article 7 of the Law describes the cadastre of hydraulic structures, Article 8 defines the basic requirements for ensuring the safety of hydraulic structures, and Article 9 defines the responsibilities of the user organization to ensure the safety of hydraulic structures. The declaration of safety of a hydraulic facility is described in Article 10, in which the user organization of a hydraulic facility at the stages of design, construction, commissioning, operation, decommissioning of a hydraulic facility, as well as after its reconstruction, major repairs, restoration or conservation. We are talking about the procedure for drawing up a safety declaration, the procedure for drawing up a declaration.
State examination of declarations of safety of hydraulic structures Article 11 of the Law Inspection of hydraulic structures Article 13 Creation and use of emergency material and technical reserves aimed at ensuring the safety of hydraulic structures Article 14 Responsibility for violation of regulatory documents on the safety of hydraulic structures Article 15. Law of the Republic of Uzbekistan "On the safety of hydraulic structures structures" was put into effect by the Resolution of the Oliy Majlis of the Republic of Uzbekistan dated August 10, 1999. According to this resolution, the implementation of the Law of the Republic of Uzbekistan "On the Safety of Hydraulic Structures" from the date of its publication in the press, that is, August 20, 1999, the Cabinet of Ministers of the Republic of Uzbekistan decided to bring its decisions into compliance with the Law "On the Safety of Hydraulic Structures", to ensure, that ministries and departments review and repeal their regulatory documents that contradict this Law, and that all articles of this Law - the corresponding work are carried out consistently in our country.
After our country gained independence, serious changes took place in agriculture and water management, which are important parts of our economy. The Oliy Majlis, the President of the Republic of Uzbekistan and the Government of the Republic of Uzbekistan have introduced special legal relations of laws, decrees and regulations in the field of agriculture and water management, which open up great opportunities for the development of a diversified economy. Resolution of the President of the Republic of Uzbekistan No. PF-3226 "On the most important directions for deepening reforms in agriculture" and Resolution of the Cabinet of Ministers of June 28, 2003 "Agriculture and water management of the Republic of Uzbekistan". Decision No. 290 "On improving the transport activities of the Ministry" was adopted, according to which the Ministry implemented state management of surface and water resources based on the principles of basin management of irrigation systems and market principles of water use at all levels. Engineering structures that directly carry out water management activities are called hydraulic or hydraulic structures [6]. The task of hydraulic structures is to regulate the flow and level of water, take it from the source in a certain quality and in the required quantity at any time and deliver it to the necessary places (arable land, hydroelectric power stations, etc.). Hydraulic structures are divided by location into rivers, seas, lakes, ponds, irrigation wells and underground types (see Fig. 1).

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FIGURE 1. FUNCTION OF HYDRAULIC STRUCTURES – REGULATION OF WATER FLOW AND LEVEL.

Due to the different climatic, geological and hydrogeological conditions of the water industry, there are different designs of hydraulic structures. To facilitate the study of the above issue, they are classified according to the following criteria: 1) provision of services to the national economic network; 2) terms of use; 3) on assignment; 4) on responsibility; 5) by design and material, etc.Classification of hydraulic structures by purpose, design and materials(see Fig. 2).

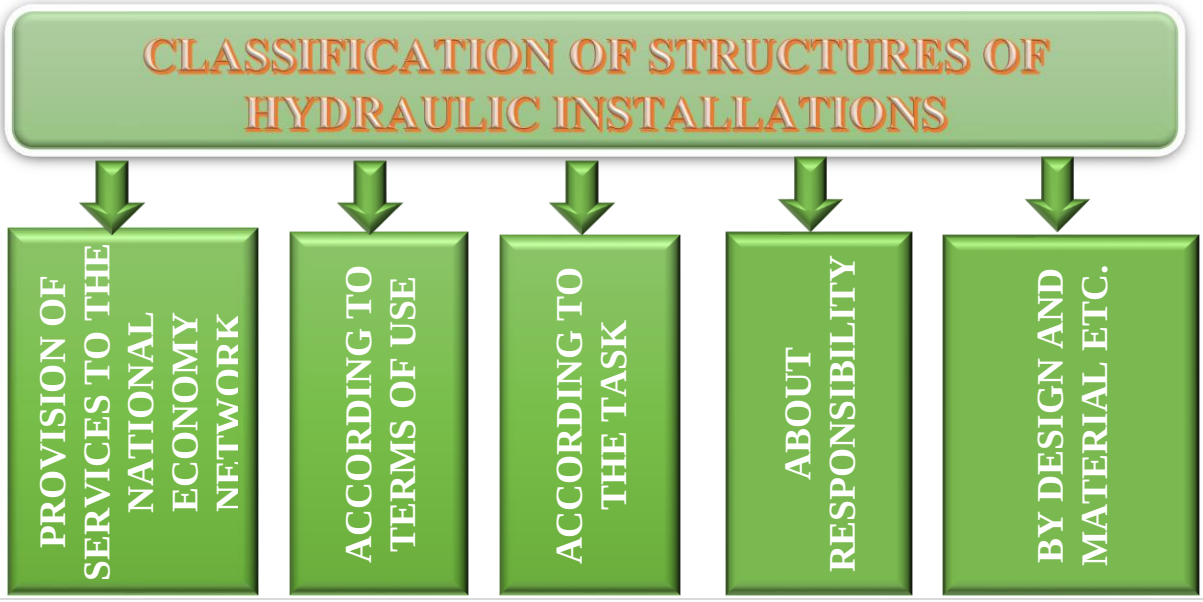

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FIGURE 2. CLASSIFICATION OF HYDRAULIC STRUCTURES STRUCTURES

It is known that hydraulic engineering, according to its purpose, is divided into the following various structures, including: water humidification - creating a certain pressure, absorbing this pressure (ponds, dams, structures blocking the flow of water, etc.); controller – controls the flow of the river and the influence of waves on the shores of seas and lakes (directing dams, spurs, bank protection structures); water intake - a water intake from water sources (watercourses, reservoirs); water carrier - transfer of water from one place to another (canals, pipes, pipes, tunnels, etc.); spillway – release and discharge of water from reservoirs, basins and canals (see Fig. 3).

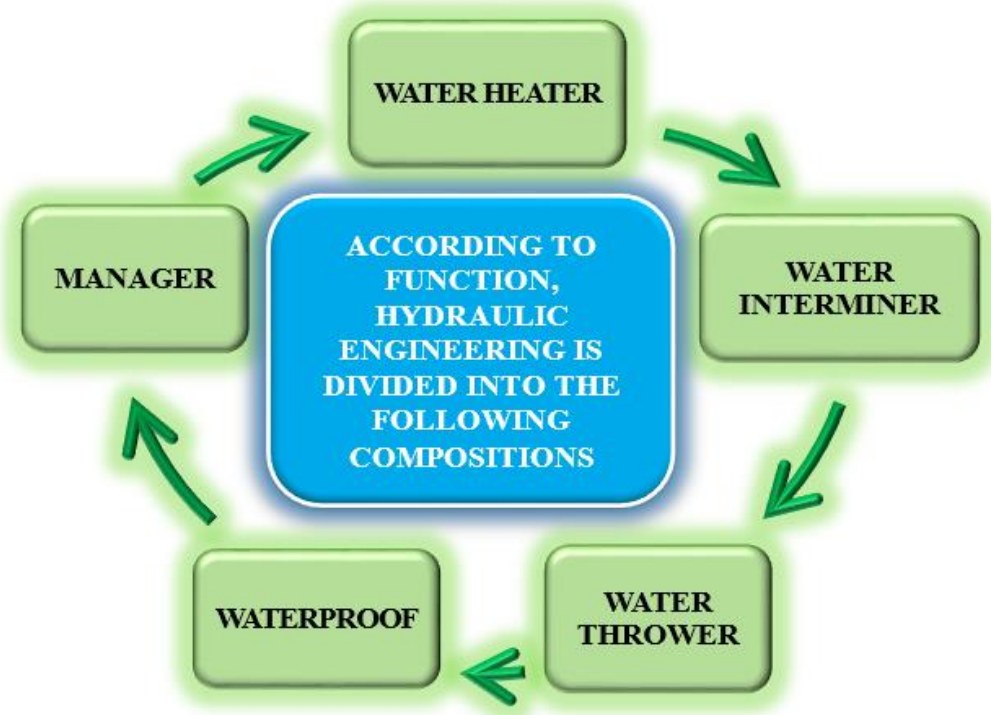

FIGURE 3. BY FUNCTION, HYDRAULIC ENGINEERING IS DIVIDED INTO THE FOLLOWING STRUCTURES

All major hydraulic structures are divided into four classes based on capital. The liability class of large water treatment facilities, such as dams, is determined based on current building codes for the height of the structure, the type of soil on the ground, and the consequences of an accident. Structures in reclamation systems are determined by servicing the irrigated or drained area (see Table 2).

Table 2. Classes of structures in reclamation systems

Irrigated or irrigated area, thousand hectares		***Capital class of permanent buildings***	
Watering	Zach escapes	Basic	Second level
300 and above	-	I	III
1000 and up to 3000	50 and under	II	III
from 50 to 100	50 and under	III	IV

If the main hydraulic facility simultaneously serves several sectors of the national economy (for example, energy, transport, land reclamation, water supply), the class of the facility is considered equal to the highest class, determined by its purpose. The class of main structures can also be raised or lowered by one class after special justification [2]. In terms of design and material, hydraulic structures are made of soil, wood, stone, concrete and reinforced concrete. Wooden structures are erected in areas rich in forests. In the construction of large hydraulic structures, wood is used in the construction of temporary and auxiliary structures and as a material for formwork. The metal is widely used in the construction of bridges, pipelines, sluices of hydraulic structures, and also as reinforcement in reinforced concrete structures. According to the conditions of operation and construction, hydraulic structures are divided into structures on the river and at

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irrigation stations. The group of structures on the river intended for a comprehensive solution of water management issues includes the following (see Fig. 4): 1) Dams that carry and do not carry water; 2) Water intake structures and devices; 3) Cooler and water dispenser; 4) Hydroelectric power station buildings; 5) Gateways for the passage of ships; 6) Moves, fish-rescue devices; 7) Anti-sediment structures and devices (clarifiers, sludge washers, drainage systems, etc.); 8) Channel management structures; 9) Structures that transport ice and ice fragments [1].

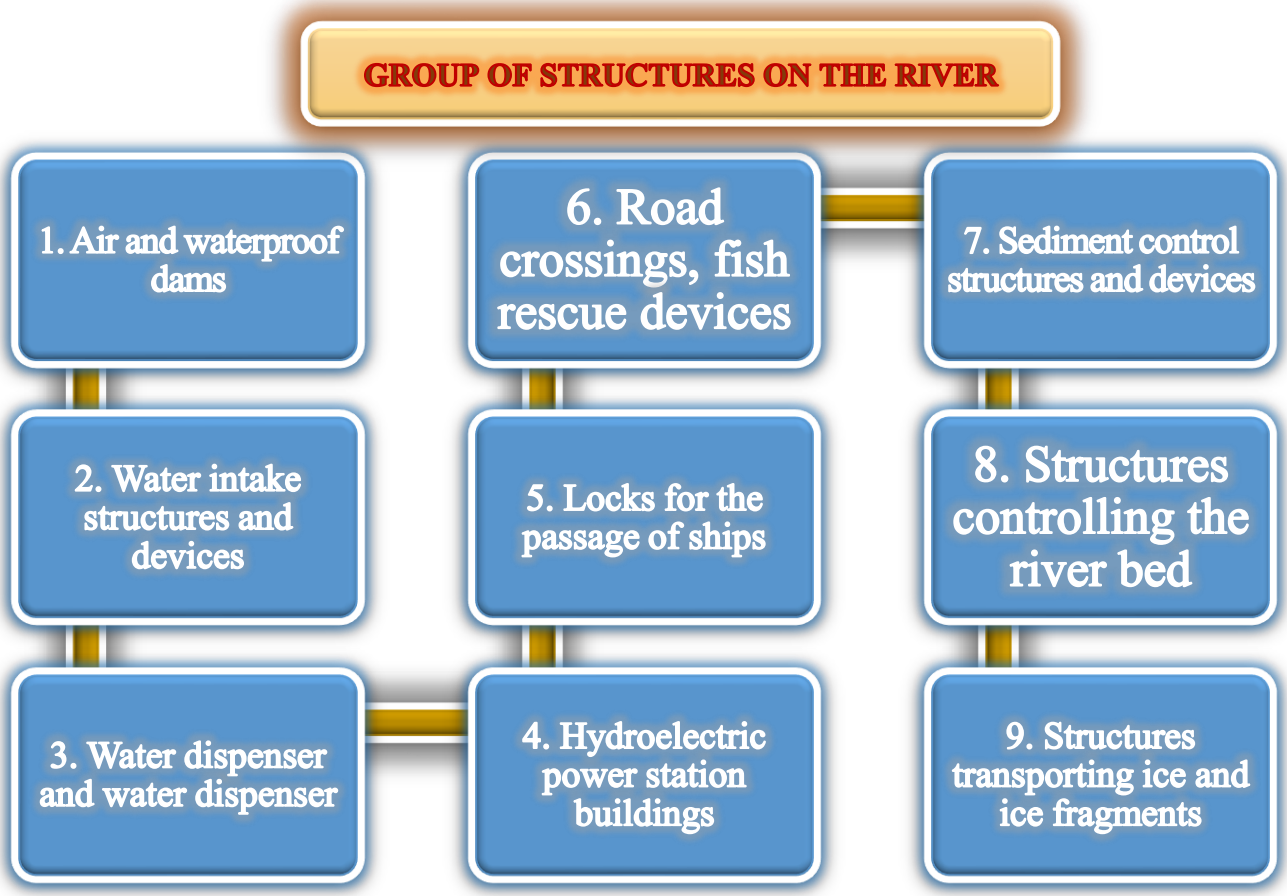

Figure 4. GROUP OF BUILDINGS ON THE RIVER

CONCLUSION. Based on the above, the main structures in irrigation tributaries are usually divided according to their function into three groups: straightening, water-transferring and connecting.

In other words, the design of the control group includes: a control regulator and water separators to regulate water flow; water level regulator (humidifier); washing and flushing devices, water measuring devices that measure the amount of water supplied to the system (automatic, semi-automatic, meters).

Accordingly, it is advisable to include the following as water-carrying structures: aqueducts, dockers, pipes, tunnels. They must be built to allow water to flow along the canal route through intersections with natural and artificial barriers.

Therefore, when the canal route passes through areas with a large slope, it is necessary to use connecting structures to protect the river bed from the risk of being washed away by water.

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