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# **Features of Water Parks and Their Use in Uzbekistan**

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**ABSTRACT:** This article discusses the project of hydro parks, their planning decisions, architecture, and the design of its elements. The typological, structural, and material foundations of the structures of hydro and water parks are analyzed. An example of a hydro park solution for the conditions of the Samarkand region is presented by the author of the article. At the end of the article, general concepts about the architecture and landscaping of the project are given.

**KEY WORDS:** Hydropark, indoor and outdoor pools, hydrocarusel, hydro attraction, fitness, wellness, prefabricated reinforced concrete, pastes.

## **I. INTRODUCTION**

The main functions of hydro and aqua parks are creating facilities for the population for sports and recreation activities as well as creating special places for having a rest around the water. Their structure and exterior architecture include structures such as harbors for sailing and motorboats in outdoor pools and hangars, indoor and outdoor pools, distinctive water attractions, hydro carousels, water trampolines, floating stage grounds, restaurants, bridges, and ropeways. It is expedient to scientifically deal with the matters of their architectural structures, considering the needs of these parks in the hot and dry climate of Uzbekistan. Today, the official typology of water park designs have not been developed yet.

However, today it is evident that architects around the world are designing and implementing indoor and semi-indoor, curved-surface water parks in the shapes of a multi-faceted pyramid and dome or semi-dome.

While designing the exterior of the aqua park, its architectural solution should focus on enhancing other functional aspects of water parks in addition to its main entertainment function. Aquaparks that are in practice as follows: 1) water mountains; 2) different views of bathing and shower rooms; 3) SPA salons; 4) fitness; 5) provides wellness and other health improvement services. Frankly speaking, today's modern water park should be a multifunctional, health, and entertainment complex with a modern service system, the architectural solution of which should reflect the internal function of water parks[1].

## **II. MAIN PART**

In modern construction, no building or structure can be built without earthworks. Similarly, for the construction of water facilities and structures of the water park strengthening its base, in other words, the foundation must be considered. Earthworks are carried out in the construction of the underground part of waterworks, the base of devices, various underground communications.

As a result of creating artificial water systems, it is possible to increase the environmental sustainability of any environment of the building, improve its quality, regulate humidity, create favorable conditions for growing the plants.

**A. We Will Briefly State About Water Constructions, The Materials Used In Their Construction, And The Construction Tools Before We Talk About The Aqua Parks.**

For the construction elements of water structures, the main construction materials are as follows:natural stone, cast iron, bronze, ceramics, and concrete.



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Granite, shell rock, sandstone, travertine, and marble are recommended to cover the surface of the pools[2]. Typically, for the constructions of water structures such as pools, fountains and waterfalls waterproof, and humidity protecting materials are used. To ensure reliable adhesion, integrity and uniformity of the moisture-resistant coating to the base, leveling, cleaning, and drying should be done, if necessary, the protective surface should be compacted and the adjacent joints of the devices should be covered with moisture-resistant coatings.

In the construction of ditches, canals, and large water structures reinforced concrete and reinforcement are used more[3].

**Decorative pools** are a key element of garden parks in hot climates; they provide the elegance of the landscape in the park, as well as have an efficient effect on the formation of buildings, monuments, decorative trees, and shrubs. The size of such pools is determined by their location.

Depending on the shape of the decorative pools - round, oval, rectangular, and perimeter they can be sanded for comfort and adaptation to the natural environment. The area of such pools is usually 10 - 50 sq.m. and more. Building materials such as monolithic and prefabricated reinforced concrete are used for the pool installation. To decorate the edges of the pool - stones, ceramic and concrete tiles, statues and bridges can be used. The lower part of the pool is decorated with ceramic tiles or mosaics of different colors and illuminated in the evening.

**A waterfall** is a special hydraulic structure of water flowing from a height of several meters. Waterfalls can be natural or artificial. Mainly the heights of the artificial waterfalls consist of one, two, and more. In this case, when the water flows down from the top, it can hit the rocks and fall into the next step or small lakes or pools.

The creation of waterfalls, which is an important com-positional element in the planning of garden parks, is a process that is of great importance and is more in line with the landscaping style.

The main part of the waterfalls is made of stone and sandstone and is decorated with various plants and grasses. Several engineering and technical steps are involved in the building process. The waterfall should be in the look mountains of the Alps. The area of water springs can be at least 1m square or in different widths, 10 – 15 meters, height on average 5 meters. Depending on the size and height of waterfalls and fountains water pumps are selected. The pumps are installed in the lowest invisible part of the waterfall basin. Requirements for the pump: its working capacity must be able to carry at least 100 - 150% of the water of the filled pool. For example, for a pool of 800 liters, a pump with a capacity of 800 - 1200 liters/hour is required. It should be noted that if the waterfalls from a great distance, the speed at which the pump lifts the water, and the bent angular position of the pipe or hose lying on the ground, the length is taken into account. The hose mounting areas are primed[7].

**Fountains** are streams of water that rise under artificial pressure and the structures that create it. Initially, the fountains were used as a source of drinking water, later they were used as a means of decorating city squares, palaces and gardens, cooling the air, creating a healthy microclimate. The fountain demonstrates the artistic and aesthetic aspects of the water and the health aspects of the air by the architects(Figure 1). Fountains are related to water structures such as wells, springs, pools.

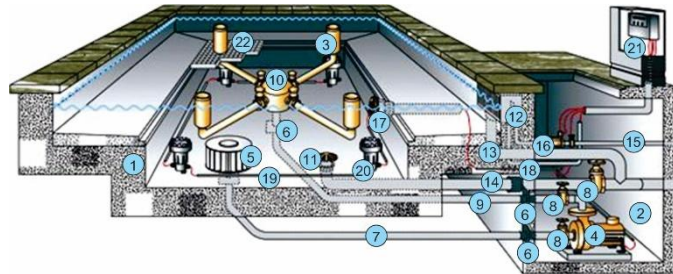
Modern fountains are being built based on scientific and technical achievements. In the evenings they are illuminated by colored lights in motion. The roaring sound of the water is coordinated with musical tones[4].

## B. Waterproof Materials

Waterproof materials - emulsions, pastes, dry building mixtures, polymer membranes, inorganic insulating materials: mineral fiber, glass fiber, foam glass.

Emulsions are dispersed systems consisting of two liquids that do not mix and are a substance that reduces the surface tension between bitumen and water. Emulsions are used as polymers and coatings that are applied cold to a dry or wet surface.

Pastes are made from a mixture of emulsified bitumen and fine soil mineral powders (lime, plastic clay). For the inner layers of the waterproofing layer, they can be used as polymers and coatings.



**Figure 1.** Technical section and equipment structure of the fountain [6]:

1-fountain pool; 2- technical place (pumping chamber); 3-fountain nozzle (sprayer); 4- onshore pump; 5-grid protection filter; 6-hermetic device that allows water to pass through the wall; 7-suction pipe; 8-control screws; 9-exhaust pipe; 10-water flow distributor; 11-reinforced drainage parts; 12-Water filling and overflow detection system (Skimmer); 13-flow pipes; 14- filler tube; 15-clean water pipes; 16-solenoid valves; 17-shielded input cable; 18-cable protection; 19-cable protection tire; 20-underwater lighting; 21-fountain control cabinet; 22-rugged decorative grille.

There are polymer membranes made of two types of thermoplastic materials: PVC (plastic polyvinyl chloride), TPO (thermoplastic polyolefins) and EPDM (synthetic rubber).

PVC membranes consist of layers of polyester PVC, which provide greater tensile strength and shrinkage of the material. Polymer membranes originated in the West 40 years ago[6]. There is a PVC tunnel membrane with a bright yellow signal layer, especially for groundwater transfers. It is a reinforcing material resistant to rooting and exposure to microorganisms. The signal layer prevents damage to the waterproof carpet when underground waterproofing is installed.

TPO membranes consist of a mixture of rubber and polypropylene.

Mineral fibers are used as thermal insulation of surfaces with temperatures from  $-200^{\circ}\text{C}$  to  $+600^{\circ}\text{C}$ .

Glass fibers, on the other hand, are a mixed texture derived from molten glass. Used for the manufacture of thermal insulation products (mats, sheets) and surface insulation.

Foam glass is a porous lightweight material obtained by sintering a mixture of glass powder with gaseous (limestone, coal). It is used in covering open and closed holes and open spaces[6].

### III. PROJECT PROPOSALS FOR THE USE OF HYDRO PARKS IN UZBEKISTAN.

This article presents the project proposals of the hydro park developed by M.M. Rakhmatova, designed to be built instead of the dry lake near the river Zarafshan located in Jambay district, The area corresponds to a geometrically right-angled triangle. The relief is relatively flat, there are depressions in some places, which are the remains of an old lake. The area is bordered on the north by “Yasham Erkaplan Carpet” LLC, on the northeast by “JV Man Auto Uzbekistan” LLC and the west and south by the Zarafshan River. The area of the site is about 19 hectares and its dimensions are 778x473x680 meters. The hydro park was designed in a free planning style based on the shape and characteristics of the place. The water supply for the park will be obtained from the Zarafshan River using electric pumps.

The main entrance to the hydro park begins after passing Zarafshan large bridge approximately 350 meters from the highway. The area in front of the entrance gate is 45 meters wide, with parking on both sides.

The administrative sections and basins of the hydro park can be accessed through the main alley, through which pass small perpendicular alleys and in the center, there is a huge fountain. There are an additional entrance and parking lot to the right of the park.

If we look at the general plan of the project, there are free-plan swimming pools at the end, on the right side, there is a swimming pool with water attractions for teenagers and adults, the deepest part of the water area for adults is 1.6 m (Figure 2).



**Figure 2.** Project proposal for a hydro park in the area adjacent to the Zarafshan River in Jambay district(Uzbekistan).

At the end of the main alley, the long bridge ends with a dining area (consisting of a pavilion and a restaurant). Its surrounding is bordered by artificial waterfalls. On the left side of the waterfall, there is a beach area (dressing room, toilet).

All water lands after the beach are designated for boat trips. There, projected a beach and islands where two boats stand.

On the left side of the project, there is a pool and attractions in the form of flowers for children, the deepest part of the water area for children is 1 m.

In the left corner of the hydro park, there are water health and fitness complexes. The complex consists of 3 parts: a health center (water treatment), a water sports center, training pools.

In the upper right corner, there is a special place for a winter pool, in other words, a small water park. Besides, the hydro park has an aquarium, fountains, pavilions, dressing booths, a household building, bicycle paths, observation decks, umbrellas, cafes, a rescue station, and toilets[7].

Projecting the architectural landscape and landscaping of the hydro park area will be carried out depending on the location, the architectural and planning solution of the area, topography, climate, soil type, and environmental construction and landscape.

In the organization of the architectural landscape of each garden park area lawns play an important role. Grasses serve to improve the microclimate of the environment.

About 3/2 of the hydro park consisted of greens. In almost all parts of the greenery, the shady atmosphere should be provided. Green areas should create an open and closed green area system.

The shores of the ponds should be arranged in groups of grasses, trees, shrubs, and perennials so that they do not obscure the beautiful landscapes of the ponds.

Instead, it is advisable to plant ornamental and flowering shrubs such as willow on the shores of the ponds, as well as a variety of rock and moisture-loving plants, including veronica, marsh bush, shrubs, and Japanese saffron. The composition of rows is used for landscaping of alleys and the facade of the park[8].

#### **IV. CONCLUSIONS AND RECOMMENDATIONS**

To sum up, to design and build suitable aqua and hydro parks in our climate, we need to pay attention to the following aspects:

- Use of cost-effective technologies and methods in the design of water facilities and equipment, taking into account water shortages;
- Application of modern coatings and materials that prevent water from seeping into the ground and evaporating;
- Application of the most compact options of composite solutions in the formation of hydro parks;
- Selection of species of hornbeam dense plants that provide as much shade as possible for open areas and areas of the water park, corridors, and beaches, etc.



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