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Study on Comprehensive Utilization of Water Resource Environment in Water-saving Design of Buildings

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Abstract: *As the precious scarce resource, how to make comprehensive use of water resources to achieve environmental protection and energy conservation is a problem that all countries have to face. The increasing demand of water used for daily use will have a significant role for protection of water resources in water conservation and comprehensive utilization of water resources during design of water supply and drainage. Taking the comprehensive utilization of various water bodies in Chinese building design as an example, this paper expounds the utilization of water bodies and the collection, purification and storage and utilization of rainwater in water supply and drainage design, providing constructive methods and suggestions for the comprehensive utilization, protection and sustainable management of water resources.*

Keywords: *Environmental protection, Water-saving design in building, Comprehensive utilization of water resources, Rainwater collection*

1. Introduction

As is known to all, due to the uneven spatial and temporal distribution of water resources, about 60% of the world's regions are facing the problem of water supply, which is caused mainly by water pollution and poor comprehensive utilization capacity. In view of the above problems, scientists have systematically studied how to make comprehensive utilization and sustainable management of water system[1-3]. Brass model and mixed flow prediction framework are established to dynamically monitor water resources.

To increase the protection of water resources, in order to strengthen the protection of water resources, all countries restrict the protection of resources in the form of laws and regulations. In particular, countries like China, which are severely short of per capita resources, have formulated the Water Law of the People's Republic of China and other laws and regulations[4-7]. The connotation of environmental protection and energy saving is to minimize the resource utilization and recycling of resources. In China, industrial water and construction water, which demand the most water, are from the source and outflow channels of water, and there are many kinds of water resources in the field of construction. Therefore, building water supply and drainage system is a crucial link of building water resources, how to integrate the concept of environmental protection, energy saving and water saving into the design of building water supply and drainage project, reduce the energy consumption of water supply and drainage engineering, reduce the waste of water resources and improve the comprehensive utilization of water resources. This has a very broad prospect for promoting the protection and sustainable development of modern water resources.

This paper takes China's construction field as an example to deeply analyze the problems existing in the building water supply and drainage system, and how to strengthen the comprehensive utilization of water resources from the design level of the building front section and strengthen the application of energy saving technology in the construction of water supply and drainage so as to provide constructive suggestions for the efficient utilization of water resources in the construction field.

2. Application of water supply and drainage system of building in China

Water supply system of buildings: The construction of building water supply is usually caused by overpressure of drainage system. The overpressure in a long time seriously affects water quality, and

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will cause water pipe cracking, resulting in waste of water resources. According to news reports, in various cities in China, leakage and pipe bursting of water supply pipelines under high pressure are common will result in a large amount of waste water, which brings great inconvenience to the construction of water supply systems and leads to a large amount of resource waste.

Drainage system: In the construction of building drainage, as the chaotic situation of the pipeline crossing, there are many difficulties in the wastewater discharge, many other pipelines are not introduced into the corresponding processing area, directly flowing into the river, lake, etc. The waste water contains high strength acidic liquid, which may damage the pipes used for a long time. At the same time, it is easy to leak in the waste water treatment, which also leads to the waste of water resources to a certain extent.

Rainwater utilization: Due to the defects of the front-end design, when a lot of rain falls, the rainwater is often discharged through the municipal pipe network, and the utilization rate of rainwater is very low. The rainwater that cannot be discharged in time often causes urban waterlogging and other phenomena, which not only wastes a lot of water resources, but also brings inconvenience to people's life.

3. Application methods and suggestions of environmental protection and energy saving concept in building water supply and drainage design

As the domestic water with a large demand for water resources, various means are used to enhance the water-saving capacity in the design of building water supply and drainage and to strengthen the implicit and efficient use of water resources so as to realize the recovery and reuse of middle water in the drainage system, which indirectly promote the protection of water resources. As a result, it has positive significance for the development of the construction field.

The application of water-saving equipment: In the process of water supply and drainage design to combine a variety of factors in saving the water resource utilization. For example, the construction of the residential pool is in the construction of three underground layers, and the height of the building can reach more than 20% of the water in the whole pool, so it requires the designer to install a frequency conversion pump in the design of the water tank, through the utilization efficiency of the pump water; In the design of cooling tower, independent design can be adopted, for example, the tank is installed about 50 meters underground in the third floor of the building, and the pressure pump is set in the water supply pump room on the roof of the building. This design not only ensures enough water on the roof, but also reflects the design concept of environmental protection and energy saving.

Optimization of hot water supply and circulation system: in the design of water supply and drainage of buildings in China, the optimization of hot water circulation system still faces the problem of waste water generation. For example, when the hot water circulation system is in use, cold water is used firstly and then hot water is used. Therefore, the design of hot water supply system should be integrated with flow rate, pipe diameter, flow rate, temperature drop, heat loss and circulation flow to determine the head loss and control point, so as to achieve safe and efficient operation of hot water supply circulation system and efficient utilization of hot water.

Utilization of residual pressure of municipal pipe network: Aiming at the problem that municipal water pipes cannot bear high pressure and water transportation of buildings cannot be realized to establish normal water supply for bottom users and pressure pump water supply for top users after the influence factors of municipal pipe network pressure and water pressure are comprehensively analyzed. Water saving is realized through multi-form parallel operation.

Water recycling of buildings: the city daily water consumption is large, and through the optimization of water circulation system, effective methods can be used to reuse building water for corresponding treatment, and the treated water can be used for irrigation area greening, road cleaning, etc. , which can effectively save water and realize the reuse of water resources.

Storage tanks for firefighting: In the process of water supply and drainage design of buildings, most designers pay attention to the design of fire water reservoir, but the utilization rate of fire water is generally low. If the fire water is not made into a part of life, it will lead to the use of water resources fails to meet the requirements of environmental protection and energy saving. If another fire water tank is stored for a long time, it can also grow and deteriorate over time with high water quality, so designers, in the water storage tank fire design, will take it as a whole to effectively avoid the above problems, it can be used to select the way to design the fire water tank, reduce unnecessary water

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consumption, which will not only to ensure the quality of water for residents, but also to achieve the idle fire water tank, urban greening water, surface cleaning and other multi-purpose water dual use.

4. Comprehensive utilization of rainwater

The rain is a kind of natural water resources, we should strengthen the rainwater collection, processing, usage and storage to maximize the realization of rainwater accumulation, infiltration and purification, promoting the use of rainwater resources and ecological environment protection, As for the processing of the rain, application and system design [8-13], China, for example, has adopted it in villa project, and formed a series of norms [14-15].

Rainwater recovery system includes water collection measures, water storage measures and water use measures.

Rainwater collection: measures for rainwater collection are mainly for roof water collection, that is, roof rainwater confluence, and the rainwater is stored in the rainwater collection tank.

Rainwater abandonment, sewage interception and filtration: the initial rainfall in the first 2 to 5 minutes is usually polluted seriously and the flow is small. The early rainwater is discharged through the drainage device. After the rainfall increases, the rainwater is collected and the rainwater sewage interception measures are set at the front end, so as to realize the functions of the initial rainwater abandonment, filtration and automatic sewage discharge. Through the rain water in the filter device bend direction, vertical flow and other ways to effectively filter the garbage in the rain water.

Rainwater storage: rainwater barrels, underground water tanks are generally used in water storage. The rainwater barrel is used for small-scale rainwater collection, precipitation, purification facilities, which are located on the ground. Underground water tanks are used in dense areas, as they are shared by multiple villas, the underground water tank can be set. The permeable water tank is a specially designed underground water tank, which can not only store water but also passively collect water.

5. Conclusion

As a precious resource, water is a kind of living water with large water demand. Strengthening the comprehensive utilization of water resources will improve the efficiency of water resources utilization. In this paper, the design principles, design methods and design considerations of water saving design in water supply and drainage design as well as the principles of rainwater collection, purification, storage and reuse are systematically described, which provides constructive suggestions for the reuse of building water and comprehensive treatment and utilization of rainwater.

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