Discussion on water saving technology of building water supply and drainage

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Abstract. According to the present situation of building water supply and drainage, water saving technology of building water supply and drainage is analyzed, and the effective utilization of water resources is realized. Water saving technology mainly includes the reasonable limit water pressure point, to avoid pressure flow; improve water supply system and reduce the invalid water; using water-saving water distribution equipment, sanitary ware; promote the use of high quality pipeline and valve; improve the status of the fire pool construction and development and promote the regeneration of water and rainwater utilization technology.

Keywords: building water supply and drainage; water saving; technology.

1. Introduction
Water is a strategic resource for human survival and development. China ranks sixth in the world in terms of total water resources, and the per capita share of water resources is only one quarter of the world average. The distribution of water resources in China is extremely uneven. Two thirds of the cities in the country have different levels of water resources shortage. In recent years, urban life is plagued by increasingly serious water resources shortage and water pollution, which not only troubles the people's livelihood, but also becomes the main limiting factor of social and economic sustainable development. Therefore, we should pay attention to the development of water-saving technology. Building water conservation is a systematic project for the whole people. In addition to formulating relevant laws and regulations, strengthening daily management and publicity and education, using price levers can also promote the development of water-saving technologies [1]. At the same time, effective technical measures must be taken to ensure the full implementation of water-saving operation management in construction [2].

2. Reasonably limit the pressure of water distribution points and avoid excessive pressure flow
Article 3.3.5 of the Code of Design for Building Supply and Drainage stipulates that the vertical partition of the residential water supply system of high-rise buildings shall ensure that the static water pressure at the water distribution point is less than 0.35 MPa, while that of the office building is less than 0.45 MPa. In special cases, the static water pressure is less than 0.55 MPa. The standard makes certain restrictions on the maximum pressure of water supply parts and service pipelines, which can not only prevent high pressure damage of water supply parts, but also save water consumption. The experimental
results show that the static pressure is 0.3 MPa, that is, the corresponding dynamic pressure is 0.22 MPa. The maximum flow rate is 0.46 L/s, which is calculated according to the rated flow rate \( Q = 0.15 \) L/s. When the tap is fully open under high pressure, the flow rate is three times that of the rated flow rate. In the sample survey of the faucet found that most faucet pressure is high, exceeding the rate of 61 %. Therefore, the problem of overpressure in the water supply system is serious [3]. The following measures should be taken:

(1) Reasonable determination of water supply pressure

The design of water supply and drainage buildings should determine the pressure of the water distribution area according to the needs and related specifications. The optimal pressure for the use of sanitary utensils is between 0.10 MPa and 0.20 MPa. At present, most building designs use the upper limit or exceed the pressure required by the specifications. In recent years, branch tube decompression has been widely used in engineering and has become an important measure to save water. In the lower part of the water supply zone, the pressure of the water supply after decompression should be taken as low as possible, and it can meet the demand for the rated flow of the water supply parts of the sanitary Ware [4].

(2) Decompression measures in the system

In the water supply system, pressure relief equipment is arranged appropriately, and the pressure is limited to the pressure required by the specification, so as to avoid the damage of overpressure flow to the pipeline. The pressure relief valve can reduce the moving pressure and static pressure, and has good running characteristics. It has obvious effect on throttle and sound absorption and has been widely used in new buildings. However, the price of pressure relief valves is expensive, so most economic comparisons in economically backward areas are not taken into account. Proportional relief valve structure is simple, the price is reasonable, and the decompression effect is also guaranteed. It is recommended to use in economically backward areas. Compared with the decompression valve, the structure of the decompression orifice plate is relatively simple, with less investment and easy to manage. However, the decompression orifice plate can only reduce the pressure and can not reduce the static water pressure. Therefore, it can only be used when the water supply pressure is not high [5].

3. Improve the hot water supply system to reduce the flow of invalid cold water.

With the improvement of people's living standards and the improvement of building functions, the building hot water system has gradually become an indispensable part of the building water supply system. According to the investigation, most of the centralized hot water supply systems have serious waste phenomena, which are mainly reflected in the fact that the water heater can not get satisfactory hot water in time after it is opened. It is necessary to empty part of the pipeline's cold water to achieve a satisfactory water temperature. The current water supply and drainage design standard proposes three hot water circulation methods, including branch pipe cycle, riser cycle and main pipe cycle. A non-circulating hot water system can be used in small hot water supply systems, such as the washing center of the factory, and no circulatory system can be used for the limited supply of hot water. Compared with the use of branch pipe cycle, vertical tube cycle, trunk pipe cycle and non-circular four different methods, from the theoretical calculation of the invalid cold water volume and the corresponding backwater system engineering cost estimates [6]. From good to bad, there are branch cycle, riser cycle and trunk cycle and no circulatory cycle. Calculated according to the liquidation time of the funds, the repayment time of the investment of the support management cycle is about 30 years, the liquidation time of the vertical cycle is about 12.5 years, and the liquidation time of the trunk cycle is about 12.7 years [2]. And ... Therefore, considering the water-saving effect and engineering cost, in the new centralized hot water supply system, the main pipe circulation method and the non-circular pipeline system should not be used. Depending on the nature of the building, construction standards, regional economic conditions and specific circumstances, the pipe cycle or riser cycle can reduce or even eliminate the waste of invalid cold water.
4. Adoption of water-saving water distribution equipment and sanitary Ware

(1) Adopt water-saving water distribution device

When pipe pressure is the same, energy-saving faucets can save 20% to 30% of water compared to conventional faucets. Ceramic valve core water-saving faucet not only has good sealing performance, but also has significant water-saving effect after closing. In particular, when the static water pressure is high, the ordinary faucet will produce a large amount of water, but the faucet will mist the water under high pressure to achieve water-saving effects. Water-saving showers can save half as much water as a normal shower, with only 9 litres per minute. Delayed self-closure or photoelectric control of faucets and washing valves used in public buildings can also achieve water-saving effects because the timing of the discharge of these sanitary devices can be adjusted within a certain range. On the other hand, these sanitary devices themselves can prevent the transmission of bacteria [7].

(2) Use of water-saving cleaning equipment

Residential flushing water accounts for about 30% to 40% of the total water volume. In the current residential buildings, large and small toilets share the same toilet, using the same flushing water, and the volume of water per flush is greater than 11L of water, which is obviously wasted. At present, the new type of toilet that is gradually promoted on the market has a flushing water of less than or equal to 6L. The urine of the stool is divided into two flushing waters. The flushing water of the urine is 3L, and the flushing water of the stool is 6L. The application of this technology can save a lot of water.

5. Promoting the use of high-quality pipes and valves

The galvanized steel pipe has been widely used as a water supply pipe in the construction water supply system. However, galvanized steel plate is not resistant to corrosion and is easy to produce and breed bacteria. It will not only cause serious secondary pollution to the water quality, but also the pipe leakage caused by corrosion will lead to the construction environment. And waste of water resources. A document issued jointly by the Ministry of Housing and Construction, the Ministry of Construction, the Ministry of Public Security, and the Ministry of Land and Resources requires that: Since June 1, 2000, cold galvanized steel pipes are prohibited from being used in water supply pipelines. According to local conditions, hot galvanized steel pipes have gradually been banned from use and the use of new integrated model tubes has gradually been promoted [8].

In the building water supply system, Plastics pipes with wide applications mainly include low-plastic rigid polyvinyl chloride tubes (PVC-U), chlorinated polyvinyl chloride tubes (PVC-C), high-density polyethylene (HDPE), cross-linked polyethylene tubes (PE-X), polypropylene tubes (PP-R), Polybutadiene tubes (PB) and acrylonitrile-butadiene pipes (ABS) and other composite pipes, metal pipes commonly used aluminum plastic composite pipes, coated steel pipes, steel plastic composite pipes, copper pipes and stainless steel pipes and so on. Compared with galvanized steel pipes, plastic pipes have the advantage of low price. Although copper pipes and stainless steel pipes have higher costs and longer life expectancy, they can also be used in hot water systems. Therefore, it is advisable to consider the functions, performance, specifications, water level and water supply required for the design before selecting a suitable quality water supply pipeline. Valves are the most commonly used accessories in building water supply and drainage, and their type and quality are the key to affecting water conservation. In general, the cut-off valve closes tighter than the gate valve, and the gate valve closes tighter than the butterfly valve. The hydraulic valve is an upgraded product of the floating valve, which overcomes the disadvantages such as large volume and easy blockage of the floating ball valve. Under the same conditions, the priority should be to select the valve with good water-saving effect.

6. Improving the Construction Status of Fire Fighting Pool

According to the current standard of our country, when municipal water supply network or natural water source can not meet the fire demand, fire pool should be set up. During the duration of the fire, the volume of the fire pool should meet the requirements of indoor and outdoor water use. In this way, the size of the fire pool in each high-rise building is very large, and by calculation, the volume will reach several hundred cubic meters to several thousand cubic meters.
There are two ways of construction of general Fire-fighting pools, namely, the joint construction of Fire-fighting pools and water supply pools and the independent construction of Fire-fighting pools. In the case of the combined construction of Fire-fighting and water-supply pools, because the amount of Fire-fighting water stored in most buildings is much greater than the storage capacity of drinking water, the drinking water stays in the tank for too long, resulting in the loss of residual chlorine, resulting in a decline in water quality. Therefore, the new building requires the establishment of drinking pools and Fire-fighting pools respectively. The construction of Fire-fighting pools not only occupies valuable building space independently, but also consumes a lot of construction investment. In addition, due to the low frequency of use of Fire-fighting water, Fire-fighting water is prone to odor. In order to ensure the quality of fire water, fire water must be replaced regularly, resulting in waste of water resources. To this end, some suggestions are put forward for the construction of Fire-fighting pools:

1. Appropriate use of fire fighting regional cooperation model

With the development of urban construction, the density of high-rise buildings has grown rapidly. The government departments should coordinate relevant units and departments, promote the sharing of a fire pool in adjacent buildings within the same block, and establish a shared control center according to actual conditions. The design of Fire-fighting pool shall conform to the standard of Fire-fighting water in buildings, and the relevant beneficiaries shall bear certain expenses according to the construction scale. This not only saves investment, but also reduces waste, ensures fire quality and ensures safety.

2. Development of renewable water as a source of fire protection

At present, some cities with serious water shortage in China have carried out the exploration of the construction of renewable water system. It requires the establishment of medium water systems in public buildings, especially in large hotels, hotels, etc. If we use recycled water as a source of fire, we can greatly save drinking water. Rational use of recycled water, or the combination of recycled water and fire water, forms an effective cycle, which solves the problem of secondary pollution caused by long-term water distress in the fire pool.

3. Make full use of urban water resources

With the continuous development and popularization of the urban water supply network, the capacity and reliability of municipal water supply have been greatly improved. When the municipal water supply network can meet the fire water demand, it is recommended to cancel the indoor fire pool and collect water directly from the municipal water network.

7. Development and dissemination of renewable water and rainwater use technologies

Building water conservation not only means reducing the demand for water, but also increases the value of water use. In areas with severe water shortage, improving the utilization efficiency of reclaimed water and rainwater is an important part of water saving.

The water quality after renewable water treatment usually does not meet the stipulated drinking water quality standards and can be used for flushing, urban greening, car washing, fire fighting and other living, municipal and environmental water use. According to the survey data, after the use of the water reuse system, residents will save 30 % to 40 % of water use, while the emissions will be reduced by 35 % to 50 %, commercial residential areas can save 70 %, and scientific research institutions can save about 40 % of water use. The general residential community can save 30 % [5] With the development of the city and the improvement of people's living standards, the city's water consumption will continue to increase. In areas where water resources are scarce, the price of water will maintain a certain rate of growth. Therefore, the development of water-saving technology is in line with the requirements of economic development [7].

Like reclaimed water, rainwater recovery is the process by which rainwater is collected, stored, treated, and used as a mixed water. Since 1980, Europe, Japan and other countries have conducted surveys and studies on rainwater harvesting and utilization. Studies have shown that when rainwater recovery systems are established, water collected, stored and treated can be used to flush toilets, clean vehicles, afforest, spray streets or supplement landscape water and rivers to save a large amount of water resources. But not every place is suitable for a rainwater recovery system. For areas with insufficient
rainfall or low water consumption, there is no need to build a rainwater recovery system because the cost recovery of the system will be slow [8]. Therefore, the establishment of rainwater recovery system should be carefully considered according to the local rainfall characteristics, water prices, construction costs, operating costs and water consumption.

8. Conclusion
Construction water-saving technology saves water resources, which is a systematic project that benefits future generations. We should combine water conservation with the development of water conservation technology, and water conservation with water resources development. The policy of water conservation is the guarantee of sustainable development. Under the condition that the carrying capacity of water resources is declining and the water environment is deteriorating, we should carry out publicity and education on water-saving consciousness, improve the relevant legal system, comprehensively use various protection measures, and develop new water-saving technologies. These methods can not only alleviate the contradiction of urban water supply demand to some extent, but also reduce waste and achieve good social and environmental benefits.

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