

# Water Supply and Drainage Design for Prefabricated Buildings Under the Green Building Concept

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**Abstract:** With the continuous development of society and the market economy, people are putting forward higher and higher requirements for the construction, technology, and environmental friendliness of buildings. The prefabricated building not only has high installation efficiency, but is also safe and environmentally friendly, which is in line with the green building concept. The drainage design is a critical part of prefabricated buildings. In order to ensure the quality and construction efficiency of the building project, it is necessary to design the building water supply and drainage properly. Therefore, an in-depth investigation on prefabricated buildings was carried out in this paper, and water supply and drainage design for prefabricated buildings under the green building concept is proposed, in hopes of providing references for future water supply and drainage designs.

**Keywords:** Green building concept; Prefabricated building; Water supply and drainage

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## 1. Introduction

The construction industry in China has been developing very rapidly and the number of construction projects has increased. The quality of water supply and drainage is directly related to the stability and safety of prefabricated buildings. Besides, in the design of water supply and drainage systems for prefabricated buildings, it is also necessary to follow the pace of social development, fully implement the concept of green building and focus on improving the environmental protection through the design, so as to further promote the development of prefabricated buildings. The quality of the drainage design is directly related to the stability and safety of the prefabricated building.

## 2. Prefabricated buildings

Most of the prefabricated components used in the construction of a prefabricated building are assembled on site. Therefore, the prefabricated components play a very important role in the construction of a prefabricated building, not only to meet the construction needs of a prefabricated building, but also in assembling the prefabricated components together using various techniques to complete the building structure. The characteristics of prefabricated buildings are shown in **Table 1**.

**Table 1.** Characteristics of prefabricated buildings

<b>Features of prefabricated buildings</b>	<b>Advantages</b>
Pouring is rarely required at the construction site	Reduces pollution of the surrounding environment
Simpler construction process	Shortens the construction period of the building
Simultaneous renovations can be carried out	Contributes to the early commissioning of building works
High requirements for components	Helps to ensure the overall quality of construction work
In line with the green building concept	Helps to improve the greenness of construction projects

### 3. Water supply and drainage design for prefabricated buildings under the green building concept

#### 3.1. Designing domestic water supply and hot water systems for prefabricated buildings under the green building concept

In the design of the water supply and hot water systems, the location of the riser pipe wells must be clearly defined, and the installation of the main riser pipe must be carried out strictly in accordance with the design requirements <sup>[1]</sup>. The design method of the domestic water supply and hot water system for prefabricated buildings under the green building concept is shown in **Table 2**.

**Table 2.** Design methods for domestic water supply and hot water systems in prefabricated buildings under the green building concept

<b>Design of domestic water supply and hot water systems for prefabricated buildings</b>	<b>Content</b>
Reserved design	The water supply and drainage pipes in the prefabricated buildings are generally constructed by means of open installation. This technique is not only simple, but also very convenient and does not need to be coordinated with other building construction processes.
Pre-embedded design	Slotted pipes are often required during the fabrication of PC components. This design method also has the disadvantage that the requirements for prefabricated pipe slots are very high.
Pipe-separated design	Most of the pipes' components need to be joined together before the construction of the building. Although this design method is very scientific, it places higher demands on the quality of the pipes.

#### 3.2. Optimizing the water supply and drainage design for prefabricated buildings

There are some problems in the design of the water supply and drainage for prefabricated buildings, which are shown in **Table 3**.

**Table 3.** Problems in the design of water supply and drainage for prefabricated buildings

<b>Problems in the design of water supply and drainage for prefabricated buildings</b>	<b>Impacts</b>
Inadequate water and drainage pipes	Not in line with the green building concept and causes water wastage
Inadequate drainage pressurization	Low water pressure
Low water utilization in water supply and drainage	Poor water circulation, and the water is not clean

The focus of water supply and drainage designs should be on the core of the green building concept, that is energy saving and environmental protection. Therefore, the building water supply and drainage system design should be further optimized, so as to make better use of water resources and reduce wastage. To avoid unreasonable placement of water supply and drainage pipes, the pipes should be made of good quality plastic, which can replace metal pipes. The quality of the pipes directly affects the function of the pipes. Therefore, when designing the drainage system for a fabricated building, it is important to source from reputable piping suppliers. It is also necessary to pay attention to the water pressure. Under the concept of green building, when optimizing the design of water supply and drainage in prefabricated buildings, in order to prevent the uneven strength distribution of the pipes due to high pressure, glass fiber, thermosetting, and other materials can be used for pipe linings. Besides, it is also important to ensure that the parameters of the pipe linings are compatible with the drainage pipe, so that there is no large gap when the two are connected, which can not only reduce water wastage, but also ensure the quality of the drainage pipe <sup>[2]</sup>.

### **3.3. Design of built-in bathrooms for prefabricated buildings**

Sanitary ware is a very important part of the drainage design, and it is not just an installation of components <sup>[3]</sup>. In fact, the whole bathroom is formed by a combination of various sanitary ware and matching accessories, including water and sewage pipes, valves, and many other accessories. The green building concept can be applied in the design of bathrooms can be installed in the base of the molded chassis, so that there is no need to use cement and sand, etc., only adhesives and screws. It is a dry construction method, which not only saves labor costs, but also greatly reduces the construction period of the water supply and drainage of the prefabricated building. This method is suitable for prefabricated houses, hospitals, hotels, and other buildings with a large number of standard toilets. For example: 4 to 10-storey staff dormitories, because the dormitory buildings have many bathrooms of the same size and the bathrooms are relatively small, so it is more suitable for the installation of the whole bathroom.

### **3.4. Application of BIM technology in the design of water supply and drainage for prefabricated buildings**

In the case of water supply and drainage of prefabricated buildings, the holes required for the installation of water supply and drainage pipelines are created when the prefabricated components are produced, and they cannot be adjusted again in the subsequent construction process. Therefore, if it is not possible to ensure the accuracy of the position and size of the pre-drilled pipeline holes at the preliminary stage. as a result, the pipelines cannot be installed properly, and its consequences will be unimaginable <sup>[4]</sup>. The application of BIM technology in the design of water supply and drainage in prefabricated buildings is very crucial to improve the fitting of the pipes in prefabricated buildings. In this way, the situation of inaccurate holes can be prevented, which avoids delays in the construction of the building and reduces wastage of construction materials. For example, BIM technology can be applied at the initial stage of the construction of a prefabricated building, where a three-dimensional model can be used to detect whether the water supply and drainage pipelines would collide in advance, so as that the water supply and drainage pipelines could be installed smoothly in accordance with the relevant requirements. The integration of BIM technology into the design of water supply and drainage for prefabricated buildings will definitely improve the construction efficiency of prefabricated buildings to a certain extent.

## **4. Conclusion**

In short, with the continuous development of the market economy and the growing problem of environmental pollution, people are becoming more aware of the importance of environmental protection. Therefore, the construction industry must follow the development of society and strengthen the

implementation of the green building concept. In this paper, the design of water supply and drainage for assembly-type buildings is optimized based on the green building concept. The design of water supply and drainage is directly related to the safety, stability, and environmental friendliness of the water supply and drainage system. In order to improve the level of drainage design and reduce water wastage, it is necessary to strengthen the understanding of prefabricated buildings, accurately grasp the characteristics of prefabricated buildings, and discover the problems in the drainage design of previous prefabricated buildings and the impact of these problems. It is important to optimize every detail of the design, so as to meet people's needs for water supply and drainage while ensuring that it is green and environmentally friendly, thus further promoting the development of prefabricated buildings.

### **Disclosure statement**

The authors declare no conflict of interest.

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