

# Discussion on the Application of Green Building Materials in Civil Engineering Construction

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## Abstract

Energy conservation and environmental protection is the main development concept of the construction industry nowadays. Building materials are the main components of buildings, which should meet the ecological requirements of current social development in order to improve the efficiency of energy conservation and environmental protection of construction projects. This paper explains the connotation and meaning of green building materials, and discusses their application and management.

## Keywords

Application; Green Building Material (GBM); Management.

## 1. Introduction

Building materials science always develops with social productivity. Since the 20<sup>th</sup> century, the economy of the world has reached a whole new level, science and technology have gradually grown stronger, and people's living conditions have continued to improve. With the improvement of material life, people's standards and requirements for the living environment are also becoming higher and higher, and more and more attention is being paid to environmental protection. In order to adapt to the economic construction, social development and people's needs nowadays, green building materials should be preferred in construction projects.

## 2. The Connotation of Green Building Materials

### 2.1. Concept

Green building materials are also called ecological building materials or pollution-free building materials. It refers to the concept that a minimum quantity of natural resources and a large number of industrial waste residues and waste liquids are used as the raw materials to produce the building materials by adopting low-energy-consumption manufacturing processes and pollution-free production technology. No harmful and toxic substances are used in the preparation of raw materials and product production. The product design is people-oriented, with the aim to improve the living environment and quality of life, and the products can be recycled and do not produce waste that pollutes the environment.

### 2.2. Characteristics

The characteristics of green building materials can be divided into five levels: 1. generating less waste: green building materials are generally reusable or recyclable, through fusion, repair, or change of material form, to achieve the purpose of reducing the pollution of the environment caused by industrial waste; 2. less resource loss: most green building materials are of waterproofness, light weight and high capacity, and consume less energy during production and use; 3. excellent performance: green building materials are often better than the traditional

ones; for example, the plasticizing wood used nowadays has the characteristics of compressive shear strength; 4. improving the living environment: green building materials have the functions of improving the living environment and health, such as optimizing indoor air quality and improving living space; 5. recycling the industrial waste: the use of the green building materials use the industry waste to improve the efficiency to use resource and make the building materials more environmental-friendly.

### **3. The Importance of Applying Green Building Materials**

#### **3.1. In Line with the Concept of Green Development**

Architectural projects consume large amounts of energy and produce pollutants from construction to use. Although the construction industry promotes national economic development, such development is inevitably at the expense of the environment. Green building materials have a variety of characteristics such as energy conservation, environmental protection, recyclability, etc. Its application in housing construction projects is a good fit for the green development concept advocated today, highlighting the new trend of green consumption and green buildings. Therefore, the application of green building materials in construction projects has great significance to the overall strategic planning of sustainable development.

#### **3.2. Meeting the Requirements of Consumers**

In recent years, along with the continuous improvement of people's quality of life and the overall enrichment of their knowledge, people's standards and requirements for the living environment have also been higher and higher, and the traditional form of architecture obviously can no longer meet the public's needs for environmental protection. In the past, the building materials easily polluted people's living environment and produced radiation and toxic substances, which threatened people's health. In contrast, in the process of using green building materials, safety and quality control is carried out around the three aspects of manufacturing, application and recycling of raw materials, effectively protecting people's health. Therefore, consumers are more inclined to choose green building materials.

#### **3.3. Laying the Foundation of Green Building**

Green building materials are a major foundation for the construction of green buildings. In the green building project, people pay more attention to the greenness and safety of the building itself. The effective application of green building materials is a very critical part. If the green building materials are not used, the green buildings that meet people's requirements cannot come into existence.

### **4. Research on the Application of Green Building Materials**

#### **4.1. New Concrete**

Concrete materials are frequently used in building construction. With the traditional mixing ratio, adding admixtures such as fiber and mineral substances can enhance the performance of concrete, which in return can withstand the harsh environment while reducing the damage to the environment. Green concrete materials mainly include high-performance concrete materials, renewable concrete materials, synthetic fiber type concrete materials and multi-void type concrete materials. Most of the raw materials used in green concrete materials are discarded concrete from the construction of buildings. Re-processing and utilization of the discarded concrete can not only reduce the waste of resources, but also respond to the call of a large amount of country for waste utilization, reducing the cost of material production and the impact of waste materials on people's living environment.

## 4.2. Eco-building Glass

Glass is mainly installed on the exterior walls, with a large light-receiving area, difficulty in cleaning and other characteristics. By leveraging these characteristics, the more environmentally friendly green building materials can be developed and the Eco-building glass can be thus born. For example, color-changing glass can increase the light transmission rate while meeting the requirements of indoor temperature control. It can increase the indoor temperature in winters and reduce the light transmission rate in summers, ensuring that the requirements of light transmission are met and that the indoor temperature is not too high. The self-cleaning glass can solve the problem faced by the traditional glass, namely difficult to clean, because it comes with a catalytic effect, which can decompose the surface oil. On top of that, the hydrophobicity of the glass surface allows rainwater to carry away the dust covering the surface.

## 4.3. Thermal-insulation Building Materials

Thermal-insulation building materials have low thermal conductivity, and are mostly laid on the surface of the external wall of the building, mainly to play the role of thermal insulation. In general, the peripheral protection structure of the building will lose a lot of thermal energy. In order to achieve the building's goal of energy conservation, it is necessary to choose green Thermal-insulation materials and exterior wall insulation technology to ensure the environmental protection and practicality of the building. Green Thermal-insulation materials commonly used in building engineering are mainly in module form and paste form. Due to their relatively simple construction methods and low cost, they are more and more widely used in building construction today.

## 4.4. Environmentally Friendly Green Boards

At present, there are many different kinds of environmentally friendly green boards in the building materials market, and the use of these materials has optimized people's living environment. Colored building boards come in different colors. Based on the coloring time, they can be divided into pre-colored boards, which are obtained by infusing the non-polluting colored nutrient liquid into the trees during their growth, and post-colored boards, which are obtained by treating the wood planks with colorants, in order to create a good visual effect. Hydrophobic boards have good water resistance, and the main production principle is to transform the hydrophilic active hydroxyl groups in the lumber into acetyl groups with strong hydrophobic properties. These materials have low swelling and water absorption rates, and are commonly used in the south to better cope with the humid environment in the rainy season. In addition, there are such as plasticized boards, porcelainized boards and other environmentally friendly green boards. These materials have better performance than traditional boards and can meet the high requirements of modern buildings.

# 5. Management of Green Building Materials

## 5.1. Basic Principles of the Application of Green Building Materials

The first principle is cost reduction. Generally speaking, the goal of a construction project is to pursue certain economic benefits, that is to ensure quality while reducing the cost to enhance the overall profit of the whole project. Therefore, in the construction of buildings, it is necessary to take account of the actual project, give full play to the environmental protection advantages of green building materials, and control the cost, so as to lay the foundation for obtaining higher social and economic benefits.

The second principle is energy conservation and emission reduction. The use of green building materials is to fit the value orientation, which is the society's increasing demand for

environmental protection. For this reason, it is necessary in green building projects to rationally allocate resources, effectively improve resource utilization, optimize resource structure, and ensure the consistency of green building materials and environmental protection.

## **5.2. Characteristics of Management of Green Building Materials**

The first characteristic is the whole life cycle. Management is a continuous process of activities, including 5 functions of planning, organization, leadership, decision-making, control. Because these functions are interrelated, the management process is reflected as a continuous process of activities. In the management of green building materials, as a branch of management, there is no exception either. Every link of production and construction requires managers to carry out supervision and assessment as required by green standards and implement comprehensive management of the quantity and quality of green building materials, to ensure that the greenness of the related building materials or construction project meets the expected standards.

The second characteristic is the delicacy management. Because of the management of the whole life cycle of green building materials, the traditional extensive management can no longer meet the management needs at this stage. Therefore, the management of green building materials needs to adopt a delicacy management concept, which requires that the materials should be managed comprehensively in the process of transportation and construction, so that the use of all materials can be reported to the personnel responsible for the next link after the completion of the project, thus providing a basis for the later maintenance of the building.

## **5.3. Impact of Green Building Materials on Management**

### **5.3.1. Impact on Construction Management**

As a new type of construction materials, each use of green building materials is a new attempt for the construction units, which means that project managers need to optimize the material management plan by considering the specific conditions of the project. For example, the construction units should plan the incoming management, construction scheduling and inspection and maintenance management of the green building materials, so that the quality of materials can be guaranteed at all stages of construction. If the construction units using new green building materials continue to employ the traditional material management schemes, there may be a problem that the storage environment of green building materials cannot meet the requirements, resulting in changes in the performance of the materials. This will in return render the new green building materials unable to meet the requirements of the building construction for the materials, resulting in the waste of resources and higher costs.

### **5.3.2. Impact on Cost Management**

The application of green building materials in engineering construction is increasingly becoming one of the core competitiveness of enterprises. According to the current market of construction materials, the cost of green building materials with low carbon and high environmental-protection performance is relatively high, so the utilization of green building materials is likely to lead to the rise of the total project cost. How to measure the economic and social benefits brought by green building materials and obtain higher profits while taking social responsibility is a problem that engineering managers need to think deeply about.

However, with the gradual optimization of green building technology, the production cost of green building materials is expected to be reduced, and this trend of reduction has positive significance for the total project cost.

## 6. Conclusion

With the rapid development of China's economy, the wide application of green building materials has become an inevitable trend and also an effective way for enterprises to optimize cost management and create higher economic and social benefits. Therefore, green building materials should be reasonably used in the process of building construction to create more comfortable and livable civil buildings and further promote the sustainable development of the construction industry.

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