Study on the Application of Green Environmental Protection Building Materials in Engineering

Wang Jialei, Li Hongmin*, Liu Weiqiong

Civil engineering and architectural institute, Wuhan Polytechnic University, Wuhan 430023, Hubei
hongmin@whpu.edu.cn

Abstract. This paper briefly introduces the significance of applying green environmental protection building materials under the background of serious energy consumption and environmental pollution and the current development situation in China. According to the relevant literature and survey data, three restrictive factors in application of green environmental protection building materials are summarized, and some suggestions are put forward.

1. Introduction
Under the background of green energy saving as the general direction of development, China's National Development and Reform Commission, the Ministry of Housing and Urban-Rural Development, and other five departments jointly issued the Notice on Printing and Printing the Action Plan for the Creation of Green Buildings in July 2020, pointed out that should promote the application of green building materials, to build a batch of green building materials application demonstration projects, but now there are still some restrictive factors for the wide application of green environmental protection building materials.

2. The significance of applying green environmental protection building materials in engineering
China ranks first in the world in terms of the construction area. According to the data released by the Energy Consumption Statistics Special Committee of China Building Energy Conservation Association, the total energy consumption in the whole process of construction in China in 2018 was 2.147 billion TCE, accounting for 46.5% of the total national energy consumption. Among the energy consumption in the whole process of construction, the energy consumption in the building materials production stage was as high as 1.1 billion TCE. In 2018, the total carbon emissions from the whole process of construction in China was 4.93 billion tons of carbon dioxide, accounting for 51.3% of the country's total carbon emissions. Following President Xi Jinping's "two mountains" concept, China has pledged to reduce its carbon dioxide emissions after peaking by 2030 and offset them by planting trees and reducing emissions by 2060. Therefore, how to reduce the energy consumption in the production stage of building materials and reduce the carbon emission in the whole process of construction is a major challenge facing China at the present stage. Compared with traditional building materials, the production of green building materials uses less natural resources as far as possible, which can well protect China's ore and wood resources. The production process also adopts low energy consumption and pollution-free production technology, which greatly reduces carbon emissions and water pollution.
Many green environmental protection building materials have the advantages of recycling, the construction waste generated after demolition can be recycled, benefiting reduce the waste of resources.

3. The development status of green environmental protection building materials in China

Compared with Europe and America, the development, production, and marketization of green environmental protection building materials in our country start late, the development is not mature. At present, there are mainly problems such as comprehensive promotion and immature technology. Due to the insufficient implementation of green environmental protection building materials, the majority of buildings using green environmental protection materials are mainly constructed by the government at the present stage, but residents are not common.

On May 4, 2017, the Ministry of Housing and Urban-Rural Development issued the "13th Five-Year Plan" for the construction industry, which clearly required that the proportion of green building materials should reach 40% by 2020. In 2021, Guo Jinping, a member of the CPPCC National People's Political Consultative Conference (CPPCC), proposed that with a large number of demolition and reconstruction and construction sites continuously under construction, a large amount of construction waste would be generated. The government should vigorously promote green building materials and reduce the emission of construction waste.

4. The main problem in the application of green environmental protection building materials

The proportion of factors affecting the application of green building materials in construction projects is shown as follow

![Chart 1. Major obstacles to the implementation of green building materials in construction projects](image)

4.1. The project cost is high and is difficult to be accepted by Party A

The cost of building materials accounts for 60% ~ 70% of the total construction cost, so the total cost of building materials is an important basis for the construction unit to select the type of building materials. Compared with traditional building materials, some green building materials are waterproof and moisture-proof, heat-resistant and fire-retardant, and can be recycled. Therefore, the price of some green building materials is higher. Therefore, purchasing personnel tends to choose traditional building materials because of their low price. If because the information of new green building materials is not familiar leads to the wrong selection of building materials type, the wrong number of materials and construction link problems all will lead to the overall quality of the building is affected, thus increasing the maintenance cost in the later period. Since some green building materials have different characteristics from traditional building materials, the performance of green building materials may be
damaged if they are transported and stored in the way of traditional building materials. The construction schedule will be affected lead to increased labor and equipment costs further.

4.2. Lack of professional technology, construction management difficulties
Due to the late start of the development of green environmental protection building materials in China, the promotion is not enough, many construction personnel has limited expertise in green environmental protection building materials, which may lead to the wrong use of green environmental protection materials in the construction. For example, the amount of material cannot be determined, the processing and installation can not be carried out accurately according to the design drawings, which may greatly affect the construction plan of the building. The maintenance of building materials is also very important in the whole life cycle of building materials. Most of the green building materials are new materials. If there is a lack of professional technology, the strength may not reach the expected standard.

4.3. Market chaos and difficulty in material selection
With the extensive publicity of energy-saving and environmental protection concept, the prospect of green environmental protection building materials is attractive. In recent years, more and more building materials manufacturers have launched new building materials and promoted them vigorously. But not all green environmental protection building materials can achieve the ideal effect in use, because the relevant laws are not perfect and the knowledge of green building materials is not popular, now the green environmental protection building materials market is mixed, chaotic. In the trend of high profits, some green environmental protection building materials are difficult to achieve the real "green", the quality of them is worrying.

5. Suggestions to solve the problems in the application of green building materials

5.1. Through the introduction of supporting policies to improve the enthusiasm of Party A
We can learn from the United States, Japan, Britain, France, and other countries to introduce some supportive policies, such as praising consumers who use green building materials while reducing their taxes. Through the economic subsidies to consumers to promote consumers to buy green environmental protection building materials, which is conducive to improve the utilization rate of green environmental protection building materials and its market influence. Reducing Party A's tax can decrease the project cost to avoid giving up using green environmental protection building materials due to the consideration of economic benefits.

5.2. Integrated management of green building materials with BIM technology
The management of traditional building materials is more extensive, it is easy to have incomplete information and timely communication between construction units, which will cause problems in the actual construction of green building materials. The use of the BIM platform for the comprehensive management of green building materials can accurately record the information of the whole process from the production to the final removal and recycling of building materials, integrate them into a unified database. In the project, construction personnel and management personnel can share information through the cloud, so that the application of green building materials is more reasonable and more coordinated. If the RFID tag is attached to the building materials when the green building materials are purchased, and the information is collected by radiofrequency technology and uploaded to the BIM platform, the transportation situation can be accurately obtained during transportation and the arrival time of the materials can be calculated. Compared with the approximate calculation of the arrival time of materials before, it can greatly avoid the cost increase caused by material storage for a long time and delayed arrival. If the use and dosage of green building materials are designed and adjusted through the 3D modeling technology of BIM before construction, the volume, size, and dosage of building materials can be accurately calculated, the problems existing in the construction stage can be solved in advance with the greatest effort. This can largely avoid delays caused by later maintenance and rectification. The
designed construction scheme and matters needing attention will be uploaded to the information database. During construction, technicians can obtain building materials information through terminals such as mobile phones or computers, which is more accurate and faster than the traditional information transmission method. In the demolition stage of building materials, the information in the BIM platform can also be used to more accurately locate the building materials while directly obtain whether the dismantled building materials are recyclable and how to preserve them, so as to maximize the utilization rate of building materials.

Figure 1. Information flow chart

5.3. Increase detection efforts and build online databases
The construction of substandard building materials may lead to a significant increase in the cost or greatly affect the overall quality of the building, so the selection of materials in the project has always been a crucial step. For consumers’ difficulties in purchasing, we can strengthen the testing of green building materials, issue testing certificates to the merchants who pass the testing, integrate all the information records of qualified building materials with their manufacturers to the online database. It is convenient for consumers to search the online database to know whether the building materials are qualified green building materials and how to use them, as well as whether they are recyclable materials. Consumers can buy appropriate and reliable building materials more conveniently.

6. conclusion
Based on the characteristics of energy-saving and emission reduction, non-toxicity, and non-pollution of green environmental protection building materials, the extensive use of green environmental protection building materials will be the inevitable trend of the development of the construction industry. The introduction of relevant encouraging policies, the use of modern BIM technology, and the establishment of an online certification information database of materials can effectively and greatly alleviate the main problems faced by green environmental protection building materials in the application of construction projects at the present stage, and increase the application rate of green environmental protection building materials.
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