Application of BIM in green building materials management

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Abstract. Under the background of green building development, aiming at the characteristics of green building materials life cycle management, it has become a trend to apply building information modeling (BIM) to green building materials management. The research shows that BIM Technology can meet the needs of green building materials fine management, realize the information sharing and exchange among all participants in the whole life cycle management of green building materials, and effectively promote the management level of green building materials informatization in green building projects. This paper analyzes the application points and problems of BIM in the management of green building materials, and puts forward corresponding suggestions for discussion.

1. Introduction
The traditional management of building materials mainly relies on manual recording and management, which often results in the waste of materials and increases the construction cost. With the requirements of the society for green energy-saving buildings, it is imperative to carry out energy-saving management from the perspective of material management. The application of BIM Technology has been popularized in the design stage and construction stage of construction projects. At the same time, it is gradually integrated into the material management. The advantages brought by its information characteristics enhance the efficiency and quality in the construction process, and realize the fine management of the construction industry. This paper aims to study the application of BIM Technology in green building materials, and to put forward some problems for these applications, and finally provide reasonable suggestions for BIM Technology in the management of green building materials.

2. BIM Technology and green building materials management

2.1 Overview of BIM Technology
Building information modeling (BIM) is based on the relevant information data of construction projects to establish the building model. Through digital information simulation, it can simulate the real information of the building, collect the information of the construction process and manage the whole life cycle of the building. It has eight characteristics: information completeness, information relevance, information consistency, visualization, coordination, simulation, optimization and graphing. With the continuous improvement of the whole life cycle of construction projects, BIM model realizes the integration of building data in different software and platforms, and realizes the whole life cycle management of construction projects by construction units, construction units and other parties\(^1\)\(^2\).
2.2 Management status of green building materials

Material management is the general term for the planning, supply, storage and rational use of various construction materials in the whole process of production, mainly including the preparation of material plan, purchase and order, organization of transportation, storage, reasonable supply, distribution, recycling, etc.

In order to promote the healthy and sustainable development of the construction industry and accelerate the resource-saving society, we should always adhere to the green development road and the development concept of energy conservation and emission reduction [2]. Through the research, it is found that the current green building materials management still continues the traditional project material management mode. This mode has many problems. The main problems are as follows: the scattered procurement mode of the project leads to the confusion of material procurement, and the manual management mode is difficult to adapt to the requirements of the development of modern enterprises [8].

With the continuous development of green building materials, green building materials have many different categories and projects, which are directly related to many different material suppliers and manufacturers. Therefore, Cui Li, Yang Yong, Wang Xuan and other authors pointed out that it is very necessary to adopt a more refined management mode with information characteristics to manage green building materials [4][6][7].

3. Advantages of BIM Technology in building materials management

Yang Wenchao, Peng Chunyan and other authors show that using BIM Technology to manage green building materials can strictly control every link involving the use, purchase, inventory management and later maintenance of green building materials, so as to maximize the utilization rate of green building materials and reduce the maintenance and management costs of green building materials. The storage time, storage location and management mode of materials should be scientifically and reasonably arranged, so as to reduce the construction cost as much as possible and improve the quality of construction engineering [1][5][9]. Zhang Leiyang and Wang aizhuan summarized the advantages of BIM Technology in green building materials management [3][6].

Fig. 1. Management characteristics of green building materials

3.1 Quantitative visualization of materials

Based on BIM Technology, 3D green building model can be successfully constructed. The model can help material purchasing personnel, construction personnel and design management personnel to make better purchasing decision, construction decision and design decision. It can make some purchasing schemes, design planning and construction key points three-dimensional and visual, so that the relevant personnel can clearly grasp the difficulties of construction key points, progress and requirements, so as to further provide decision-making basis for the selection of material quality, model, quantity and collocation scheme [9]. For example, during the period of green building materials management, the
model can be used to realize the optimal configuration of material management, ensure the integrity and orderliness of material management to the greatest extent.

3.2 Material tracking refinement
In the construction process of construction projects, it is possible to replace building materials and increase building materials. Construction personnel will maintain and replace various green building materials used in construction according to the construction problems and user needs. However, the replacement of materials is not random, but purposeful and accurate, which requires understanding of the type, parameters, functions and functions of raw green materials Structure, production date and other historical information, so as to ensure that the new replacement materials will not affect the function of the building. The green building materials management based on BIM Technology records these relevant information in detail and comprehensively, and makes corresponding preservation and backup.

3.3 Collaborative management of materials
In the process of green building project construction, the owners, design units, construction units and green building materials manufacturers manage the building materials of the whole project together, and the whole project forms an industrial chain. Relying on BIM Technology to build green building materials management database, and connecting various departments through the Intranet can greatly improve the transmission efficiency of management information, realize the sharing of department information, and improve the cooperation and linkage of departments. Ensure that the Department can keep abreast of the changes, utilization, inventory and quality of materials at any time, and relevant personnel can also search for the use of certain types of materials by searching, because the material management database will classify various types of materials, making the management content more refined and targeted.

4. Application of BIM Technology in green building materials management

4.1 Application of ERP in material requirement allocation planning
In the process of building project construction, the use of modeling software can make design drawings, draw construction structure drawings, analyze key construction components, etc., which provides a lot of data support for the development of construction work, and is conducive to the construction unit to sort out the key risk control points of construction. The application of BIM-5D construction simulation software can improve the relevance between the 3D construction project model and the construction schedule, so as to accurately estimate the daily consumption of green building materials, the actual consumption of green building materials and the remaining inventory in the future construction process, and analyze the rationality of the material consumption in the construction process. So as to realize the accurate calculation and control of the construction material consumption, and provide the decision-making basis for the determination of the material consumption limit value and the procurement plan system.

| Component information | Calculation formula | Unit | Quantities | Grade | Management principles |
|------------------------|---------------------|------|------------|-------|-----------------------|
| Blast Pipe1000*400     | pipe materials : 1000*400 | m²  | 8.95       | ※※    | According to the data provided by BIM model, accurately control the material and quantity. |
| Blast Pipe500*250      | pipe materials : 500*250 | m²  | 12.68      |       |                       |
| Blast Pipe400*200      | pipe materials : 400*200 | m²  | 31.14      |       |                       |

4.2 The application of material storage in the field
By using BIM-5D construction simulation software, the dynamic control of material use in the construction process can be realized, which provides scientific, accurate and intuitive data for the construction unit to determine the spatial location of materials and the spatial layout of related
equipment. It is convenient for the nearby transportation and management of materials in future construction.

4.3 Application in dynamic management of material construction

Construction simulation. The three-dimensional visualization function and time dimension of BIM Technology can simulate the construction progress. Combined with construction planning, construction scheme and BIM Technology, the construction project can be comprehensively monitored, and some waste construction materials and some misused construction materials can be found in time[6].

Quality control. Applying BIM in the process of project construction quality control can reduce the deviation of product quality and product technology. BIM project technical model stores a lot of data such as material function, price, specification, etc. These data can help the construction personnel, which is conducive to the control of product quality, help the relevant management personnel to make scientific and reasonable procurement decisions, and prevent the conflict between the supply and demand of materials.

4.4 Application in material operation, maintenance and disassembly

In the process of construction, the management and protection in the later stage of the project is also an important part of the project construction. Relying on BIM Technology, the basic information of different types of green buildings can be classified, and various data formed in the use process of green building materials can be collected in real time, so as to provide reference for the later adjustment, replacement and maintenance of materials[6].

5. Problems and suggestions of BIM Technology in green building materials management

5.1 Problems of BIM Technology in green building material management.

The main performance is the awareness of personnel fine management and the lack of the establishment of enterprise BIM green management system. The quality of material management personnel is generally not high, most of them have not received professional training[9][10]. Now the problem is that many people with material management experience are often lack of systematic management ability due to the low level of education and professional theory, and college students with high level of theoretical knowledge and information management literacy are lack of practical experience due to lack of experience. At the same time, enterprises do not have complete information transmission standards, which is not conducive to the transmission and use of green building materials management information. Make green building materials management can not play the maximum efficiency[11].

5.2 Application suggestions of BIM Technology in green building materials management.

Based on the existing problems and current situation, a large number of research thinks that it is urgent to establish a BIM green building material management system and professional personnel training system. BIM Technology has brought about the change to the construction engineering field, and its development will change the traditional working mode and method. It is an urgent task for BIM Technology to improve the awareness of fine management of practitioners and to strengthen the learning of emerging technologies in the practical work. Enterprises should strengthen training, enhance the awareness of practitioners on the fine management of green building materials from the cognitive level, and guide the practitioners to operate relevant software and equipment from the technical level, and truly realize the informatization and refinement of green building materials management[5][6][9][11].

6. Conclusion

With the continuous improvement of the whole life cycle of construction projects, BIM model realizes the integration of building data in different software and platforms, and realizes the whole life cycle
management of construction projects by construction units, construction units and other parties. The BIM Technology is used to manage green building materials, such as quantitative visualization of materials, fine tracking of materials, development of personalized value requirements of users, construction technology scheme and production plan of green building materials, etc., which can strictly control every link involving the use, purchase, storage management and later maintenance of green building materials. Thus, the utilization rate of green building materials can be guaranteed to the greatest extent, the maintenance and management cost of green building materials will be reduced, and the storage time, storage location and management mode of materials shall be arranged scientifically and reasonably. The construction cost shall be reduced as much as possible, and the quality of construction process shall be improved. But there are still some problems in practice, such as lack of system and training, which need to be improved in practice.

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