Study on Life Cycle Management of Fabricated Buildings based on BIM Technology

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Abstract: The rapid development of prefabricated buildings is superior to traditional buildings and strongly promotes the development of human society. The application of BIM technology in its management can not only fully reflect the superior characteristics of the assembled building, but also bring convenience to the construction and improve the building quality. This paper mainly analyzes the application of BIM technology in the whole life cycle management of fabricated buildings.

1. Introduction

For many years, China's construction industry has been using traditional construction methods and technologies, and there have been no major breakthroughs and changes. However, with the advent of the industrial revolution, the profit rate of traditional construction technology at various stages has dropped sharply, making people have to explore new ways. The new construction method of assembly-type construction has been recognized at this time. The more you pay attention. A prefabricated building is a new type of building in which components are manufactured at a prefabrication plant and assembled on site. Compared with traditional buildings, due to the large-scale production of fabricated building components, saving manpower and high productivity, many advantages such as being unaffected by the natural environment make assembly buildings a representative of the new era of architecture. However, there are also many shortcomings in prefabricated buildings, such as inaccurate precision control and high cost. Therefore, in order to maintain the momentum of advancement, it must be continuously optimized to combine with more advanced BIM technology to promote the Chinese construction industry. Better, faster direction.

2. Characteristics of BIM technology

BIM technology has the ability to carry information so that all kinds of information in the life cycle of a building can be stored in a database, and the parties in the BIM technology database are closely connected, and the participants in the construction process are It is possible to realize the sharing of resources and avoid the phenomenon that the design drawings and construction procedures are inconsistent due to poor communication. At the same time, each participant can input their own information while obtaining the information of their own resources, and realize the continuous database. The perfection and development make the construction process smoother.

The visual characteristics of BIM technology can be seen as the name suggests, and the information in the building structure can be displayed perfectly. This will reduce and avoid the mistakes of some hidden projects due to the inability to visually observe. Occurs, and the visual nature of BIM technology not only improves accuracy, but the staff can rely on their own brains to imagine and mark on the drawings, while also improving the efficiency of the work and enhancing the operability, thus Good grasp of the design's intention to better carry out the construction.

BIM technology has the characteristics of coordination, which refers to coordinating collision problems between design units and construction units due to different professions, reducing unnecessary troubles, and assuming that there are some difficulties between design and construction, BIM can be utilized. The technology directly analyzes the problem in three-dimensional modeling,

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and carries out specific analysis of specific problems. It does not need to exchange two-dimensional and three-dimensional in the brain, which is more direct and convenient, and avoids and reduces the damage caused to the project due to poor handling. Therefore, both the designer and the construction unit can use BIM technology to coordinate the various tasks in the construction, so as to effectively solve the difficulties in the construction and design process.

3. BIM applications in the life cycle management of prefabricated buildings

At this stage, BIM plays a major role in facilitating collaboration among project participants. Especially in the design stage, the problems of design conflicts caused by various professional design conflicts or subjective reasons of the owners are well solved. 1) Planning site selection, site analysis Planning site selection and site analysis are the key factors influencing the positioning of construction projects. Traditional methods have many problems, such as insufficient quantitative analysis, large amount of information data cannot be scientifically processed, and subjective factors are too much. Through the combination of BIM technology and Geographic Information System (GIS), the data of the proposed building site conditions and spatial information is modeled, complemented by BIM technology and GIS software, helping decision makers to evaluate during site selection and site analysis. The conditions and characteristics of the site are used to make the best site planning. 2) Model establishment and drawing drawing In the BIM model, each element has actual engineering meaning, including parameters such as the space size and material properties of the component. Since the models of all components are controlled by parameters, the association of model parameters is formed. Therefore, when a certain model parameter information changes in a component, all the components related to it will change accordingly, thus avoiding the cumbersome process of modifying the three views separately in the conventional manner. The BIM model can simulate the construction of new structures, new forms and complex nodes, and find the design problems as early as possible, and improve the original scheme. At the same time, the design unit can use the visual characteristics of BIM to communicate with the owner, construction unit, component manufacturer, etc. in time to greatly improve the work efficiency. 3) The traditional way of designing conflict checking often relies on subjective imagination to restore the stereogram of the building. This will easily lead to deviations from the actual situation. The design and construction conditions are inconsistent. Especially in the design of the equipment, it is easy for the pipelines to collide with each other. Unable to work properly. At this time, it is necessary to re-modify the design plan, resulting in an extension of the construction period and an increase in construction costs. When the structure engineer uses BIM for structural design, if the design conflict is caused to the hydropower pipeline, it can be displayed immediately in the BIM model, and the architect can modify the design in time, so that the design conflict can be effectively solved. 4) Engineering quantity statistics and cost management In the CAD era, because CAD software can't let the computer calculate and calculate the corresponding information of the construction project components by itself, the cost personnel need to spend a lot of time to calculate the engineering quantity. The BIM software is a database with a large amount of building information, which can provide the necessary amount of engineering information to the cost manager anytime and anywhere. With this information, the computer can quickly calculate and calculate the components, which not only avoids the cumbersome Manual operation, and can avoid calculation errors and reduce the deviation between engineering statistics and design.

Into the component production and production stage, through BIM combined with RFID technology, the components are placed into RFID tags, each RFID tag contains corresponding component information, in order to facilitate the management of components in the production, storage, transportation and lifting process. The component-related design data is read from the BIM database through the fabricated component production management subsystem, and the production information, quality monitoring information, and storage information of each prefabricated component are returned to the BIM database. Due to the unique principle of RFID tag coding, the accuracy of information in the production, storage, transportation and lifting process of components can be ensured. The perfect combination of BIM and RFID technology helps to achieve the ideal

goal of zero inventory and zero defects during the construction process. According to the actual construction progress, the information is fed back to the production management subsystem at any time, so as to timely adjust the component production plan and reduce the occurrence of waiting and waiting materials.

In the prefabricated building construction phase, two aspects of BIM technology play a major role: prefabricated component entry, storage management and project quality schedule control. 1) Admission of prefabricated components, storage management In the actual construction site, there are often cases of finding faulty components or missing components. To prevent such incidents, the requirements for construction site management are stricter. At this stage, BIM technology and RFID technology can be effectively combined to perform real-time tracking control of components. The advantage of combining BIM with RFID is that the information is read accurately, the transmission speed is fast, and the errors caused by traditional manual input information are reduced. 2) Project quality schedule control Using BIM technology, the construction unit can carry out actual simulation analysis of the construction plan, link the construction 3D model with time, establish a 4D construction model, and track the construction progress and construction quality in real time, and the actual statistics will be Compared with the original plan, the deviation is obtained. This is conducive to the optimal allocation of resources and space, eliminating conflicts, and then getting the optimal construction plan and construction organization design. Finally, enter the adjustment system and take measures to adjust the construction progress and quality to ensure that quality and progress are not affected.

In the management of the operation and maintenance phase, BIM technology can monitor information about building usage, capacity, and finance at any time. Through the BIM document, complete the seamless transition between the construction and construction phases and the operation and maintenance phase and provide detailed data required for the operation and maintenance phase. In property management, the BIM software connects with related equipment, judges the operation of the equipment through real-time monitoring operation parameters in the BIM database, makes scientific management decisions, and performs energy consumption, performance and environmental costs of the equipment according to the recorded operating parameters. Performance evaluation and timely control measures. At the same time, the effective combination of BIM and RFID technology can be effectively utilized in the access control system. In the process of building-type building renovation (expansion), BIM technology can analyze and detect the safety and durability of building structures to avoid structural damage. It can also judge whether the structural members of the model can be reused and reduce material resources. Consumption.

In the construction and construction phase, based on the design of the 3D model database, Shanghai Urban Construction Group connected the construction progress data model with the construction object through BIM technology to produce a 4D visualization model with time attributes. Implement web-based 3D environment engineering progress management with APIs in Autodesk Navisworks software. In this way, advanced quality technology methods and management experience of BIM technology are used to reduce the attenuation of effects in the information transmission process, improve construction quality management, and strengthen safety management during construction. At the same time, the group uses the handheld tablet computer and RFID chip to guide the construction personnel to hoist the positioning by means of the construction management system, fully realize the parameters of the component parameter query and the construction quality index, and upload the completion information to the database to achieve the construction quality. Records are traceable. It is through the management system platform of BIM technology throughout the design, production and construction that dynamically grasps the prefabricated production, warehousing, logistics and construction site construction control of the prefabricated building components, and displays them in three dimensions, greatly improving the site. Management efficiency.

4. Conclusion

The application of BIM technology in the life cycle management of fabricated buildings reveals its important position in the future of prefabricated buildings. BIM is not only a simple building, information and model, but has become a new architectural concept. Its development is not only a supplement to existing technology, but also a shift in thinking mode. At the same time, the development of BIM technology faces many difficulties in terms of hardware, technology and personnel quality. However, with the deepening of the understanding of BIM in the construction industry, the continuous improvement of BIM tools and the continuous development of theoretical practice, this technology will eventually promote the mature development of the life cycle management of fabricated buildings.

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