Research on Assembly Building Design and Construction Management Based on Computer Building Information Model

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Abstract. In the decades after the emergence of computer building information model, the construction industry in China is developing rapidly. With our familiarity with high-end technology, the application of computer building information model has been recognized and advocated by the government and the construction industry. In this paper, the process and construction management system of prefabricated building design based on computer building information model are studied.

Keywords: Computer, Building Information Model, Building Design, Construction Management

1. Introduction
Building information model is BIM, an engineering data model which integrates all kinds of relevant information of building engineering project based on computer digital information technology in a certain stage or whole process of building engineering planning and design, construction and operation and maintenance. It is specifically applied to system design, cooperative construction, engineering quantity calculation, metering management, equipment operation and maintenance in building engineering.

At the beginning of the 20th century, people began to study the fabricated structure, which has been popularized rapidly in the world because of its characteristics of fast construction speed and low production cost. With the continuous progress of China's economic development and the deepening of reform and innovation, the traditional architectural methods have no longer adapted to the development requirements of modern society for energy, environment, science and technology. Facing the problems existing in traditional building methods, and in order to meet the needs of marketization, relevant departments and enterprises in China actively draw lessons from the successful experience of foreign construction industrialization, introduce BIM technology, actively promote the transformation...
and development of China's construction market, vigorously develop new industries of energy conservation and environmental protection, promote prefabricated buildings, and improve the overall level of construction[1-3].

2. Application of BIM in the project implementation phase

2.1. Application of BIM technology in bidding, submission and scheme

Application of BIM technology in the project tender can show the tenderer or investor an image, visual and clear construction process, which will increase the impression of the bidder score, is a unit capacity level display process, can effectively improve the probability of winning the bid. In

The construction process management technical background, we are usually the project management organization, generally by the safety and technical management personnel to the site teams, construction personnel through the form of meetings or oral paper documents for technical disclosure, this way rigid dogma, mere formality, not acceptable results. But the technical foundation, the construction plan appraisal compilation is also always based on the construction drawing, the technical specification, the construction site actual situation, unifies the past experience to carry on, this may appear because the examination drawing is not clear or the personal expression question causes the bottom not to be clear, needs to repeat the bottom, after the bottom construction personnel is difficult to understand, the impression is not deep and so on phenomenon, then causes the construction progress, the quality, the safety and so on aspect to appear the question. However, if the virtual construction of BIM technology is used to express, the construction difficulties and hidden dangers can be reflected in advance; the visual bottom, education and other forms are also more easily accepted by the construction personnel, intuitively and vividly let the construction personnel understand the construction intention and details, which can make the construction plan more accurate, overall arrangement, and ensure the smooth progress of the project. During the implementation of the construction organization design, with the help of visual simulation of the BIM technology, the division and section of the project are analyzed, some important construction links and processes are emphatically displayed to improve management, and the construction personnel understand and remember the process[4-6]. For new entrants, this approach plays a visual effect and cognitive perspective that two-dimensional drawings cannot give, making learning more intuitive, understanding easier and more impressive.

2.2. BIM technology can make construction management, site coordination more intuitive

In the past, the management of project schedule, quality, plan, material, equipment and so on, is mainly presented in the form of various reports, which is not intuitive and real-time. The logical relationship between the branches, sections and construction points of the project is not clear enough. And the use of BIM technology can be panoramic, real-time presentation of the real-time situation of each link of the project, can be accurate to each structure, each measurement section, each precast yard, the quality of each material, progress, stock and so on, for managers to control the actual situation on the spot, allocation of resources, adjust progress is very beneficial. Through this technology, an information communication platform can be established for each work area and construction point of the project, because each work area has its own progress plan, such as adjusting its work process due to other external forces, which will lead to mutual influence, cross operation, and timely communication will reduce the mutual influence. By establishing the visual information model of the construction site, the personnel who are not proficient in other specialties can also understand

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the situation quickly and intuitively, know where the problem is, how to solve it, and make the coordination work on the spot more intuitive and quick.

3. Concept of a BIM management system
Based on the project management, in order to facilitate on-site management, practical and fast as the purpose, first set up a project BIM management system, through the actual operation, improvement, and then the project network, constitute the whole company's BIM management system, and then make each company network, constitute the group company's BIM management system. Figure 1 is a schematic diagram of the BIM framework of the project.

![BIM Construction Management System](image)

Figure 1. BIM Construction Management System for Technical Engineering Projects

4. Design method of assembly structure based on BIM technology
BIM technology is based on three-dimensional digital technology to build digital model, using the advantages of three-dimensional model to achieve multi-section, multi-professional collaborative work, can simulate the whole construction process of the structure, with visual characteristics, using the advantages of BIM technology, pay attention to the versatility of structural components, with as few components as possible to complete the need for structural diversification. Therefore, it is necessary to establish, enrich and perfect the prefabricated component library, reduce the design of components, save labor and time cost, and reduce the project cost.

4.1. Formation and perfection of component library
Too many sizes and models of assembly structure parts will seriously affect the processing and production of factories, which is not conducive to standardization and factory production. For this reason, BIM design is easy to split, visual characteristics, according to the structure type, processing
technology, applicable conditions of prefabricated parts to organize, classify, merge, select more versatile components, and establish prefabricated parts library.

4.2. Model building, analysis and optimization
After the establishment of the prefabricated component library, the data modeling can be carried out according to the specific design needs. If there is no suitable component available in the component library, the new component should be redefined and designed according to the structure needs. If the component cannot be changed in the analysis process, the appropriate component is re-selected from the component library for analysis until the analysis is passed. Optimization design of the structure mainly uses BIM technology for collision detection, size optimization and other aspects of the design, in order to reduce the problem of rework in the construction process.

4.3. Application of building models
Before assembling the prefabricated components, we can use BIM technology to simulate the whole construction process, progress, accurate control of time nodes, reasonable planning of the production, transportation, hoisting, splicing and other processes of the prefabricated components, and can timely find out all kinds of problems that have been leaked in the process, and formulate targeted solutions in advance to ensure the smooth progress of the construction.

5. Construction management research based on BIM

5.1. Construction schedule management model and information management platform of assembly building based on BIM
As many participants in the construction of prefabricated buildings, the information exchange is cumbersome, the repetition rate is high, and shortening the information transmission path and realizing the cooperative management of all parties are the biggest highlights of the application of BIM technology. The schedule management model and information management platform based on BIM technology can effectively solve this problem. The expert establishes the design, the construction data information exchange flow, through the construction stage to the design stage benchmark model consummates and updates, causes the schedule management model to obtain the continuous optimization.

5.2. Design and intelligent processing of assembly building based on BIM
The design of prefabricated buildings requires fine flow, modular design, automation of production and integration of cooperate. Otherwise it will seriously affect the orderly progress of construction activities, and then affect the progress of construction. Deepening the design of BIM model effectively improves the degree of completion and accuracy of the design of prefabricated components, and the increase of assembly rate of prefabricated buildings is of great benefit to shorten the construction period. Construction technicians participate in drawing deepening design, can improve the degree of refinement of construction drawings, greatly reduce the work of design changes in construction; part of the cast-in-place structure steel bar design optimization work is conducive to improve the efficiency of steel bar binding work, at the same time eliminate the risk of extending the construction period to pay liquidated damages. Full-professional integrated design and assembly is the premise to realize the assembly finished housing, the use of BIM technology and combined with the technical and economic conditions of the project, on the basis of the preliminary design of the full-professional integrated
deepening design, greatly avoid the later construction design changes. Component split program and standard not only affect the overall structural stability of the building, but also greatly affect the whole production plan and installation plan docking[7]. It can be seen that as the most representative building form of building industrialization, the construction process of prefabricated building integrates the management system and means of many industries, such as manufacturing industry and information industry. The central problem of its development is how to realize industrial integration, especially in the construction schedule management. The virtual construction flow is shown in Figure 2.

![Figure 2. BIM Virtual Construction Process for Technical Architectural Design](image)

5.3. Assembly building site layout and temporary facilities planning based on BIM

Site layout and temporary facility planning are the material basis for the orderly development of site production activities. BIM technology visualization makes the multi-scheme demonstration possible, and the rationality of the scheme can improve the overall operational efficiency. As can be seen, with the deep application of BIM technology, it is completely possible to realize construction site management from two-dimensional to three-dimensional management.

5.4. BIM visual assembly construction process monitoring

Assembly construction process monitoring is one of the most effective methods in construction management, and it is also an important way to maximize the benefit of construction projects. Combined with engineering practice experience, through BIM cloud information integration technology, improving the existing progress monitoring and progress report work flow, integrated information collection on the completion of construction tasks in different areas, realizing the high synchronization between site construction and model virtual construction, managers can judge the progress of construction site work without leaving home, and enhance the timeliness and controllability of schedule management.

6. Conclusion

Based on the analysis of the present situation and the research of countermeasures, the importance of
BIM technology to promote the development of prefabricated buildings is self-evident. How to integrate the BIM technology with the construction of prefabricated buildings in the next step needs to promote the industrialization and transformation of the construction industry in China through the cooperation of design, construction and software development enterprises through industry guidance, brand effect, talent cultivation, etc.

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