

# Application Research on Construction Information Integration of Prefabricated Building Based on BIM and RFID Technology

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**Abstract:** According to the construction situation of Prefabricated building, it covers many processes such as component prefabrication, transportation, assembly, etc. There are many types of prefabricated components, many participants, and higher requirements for information transmission to achieve accurate construction and management. This paper, starting from BIM and RFID technology, discusses its application in the construction process management of Prefabricated building, and verifies its management effect through case analysis, a set of information management system for the whole process of prefabricated building construction based on BIM technology has been formed, which controls and manages the construction progress, quality and cost, and improves the management efficiency and efficiency of prefabricated building construction stage.

**Keywords:** Construction Information Integration, Prefabricated building, Application Research, BIM, RFID Technology

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## 1. INTRODUCTION

As a kind of building with high efficiency, high precision, low cost, good quality and resource conservation, Prefabricated building has been widely used. Compared with its advantages, Prefabricated building also has higher requirements for technology and management, its workflow and construction links are relatively complex, and the transmission of relevant information in the project must be accurate and timely. Therefore, BIM and RFID are emerging information management technologies, it is of great significance to integrate and apply it well. However, there are still some problems in the construction process of Prefabricated building at this stage. Because this mode is to transport prefabricated components to the construction site for equipment, the actual construction progress is affected and restricted by many factors such as the manufacturer's component production efficiency and transportation mode.

In addition, since the relevant building components are pre ordered for production before construction, any changes made to the relevant plans during the construction phase will result in the need for the early components to be re produced, leading to increased construction costs and delayed construction periods. During the use of Prefabricated building, they will be limited by the environment of the construction site, and many problems will be encountered, including that the on-site construction can only be carried out after the components are transported to the site. Therefore, the processing of internal parts of the factory needs to be paid attention to during the on-site construction, so as not to restrict the construction of the project. The components required for construction are all completed before the start of the construction of the project. If the design scheme is changed on the site, The components need to be remade. Under the background of the rapid development of science and technology, various new construction materials and construction management schemes are emerging, further improving the quality of current construction projects. The construction technology of Prefabricated building is a green and low-carbon construction method in the construction of

modern construction projects, which is widely welcomed by the current construction industry.

However, it should be noted that due to the relatively short application time of prefabricated building engineering construction technology, there are relatively many factors that will have an impact on the construction quality in the actual construction process. By consulting literature, the identified quality impact factors are listed, and these factors are sorted into an initial factor table with clear expression and concise language, then the table is made into a questionnaire and distributed to employees of real estate development enterprises, construction enterprises, teachers of relevant majors in colleges and universities and other personnel. In the hoisting stage of Prefabricated building components, 4D construction simulation animation is formed based on the BIM model and the schedule plan. By simulating the real construction progress and conditions, the construction scene is previewed to visually express the construction process flow of each component and realize the visual disclosure of complex nodes. Using RFID readers to collect real-time data, the entire construction component management situation will be included in the BIM software database. BIM guides the installation work, updates, and controls the use of machinery and lifting routes in real-time, and improves construction efficiency and quality.

The IFC standard is a computer processable standard for the representation and exchange of building data, providing specifications for the description and definition of various information processed during the construction project implementation process. At the same time, IFC can overcome the problem of software data incompatibility. Therefore, to achieve maximum data sharing, BIM technology needs to be applied under the IFC standard. BIM technology based on IFC standards for digitization.

## 2. THE PROPOSED METHODOLOGY

### 2.1 Overview of BIM and RFID

#### Technology

It is to put time and cost into the existing 3D model, establish a Building information modeling, and then analyze the model. It is to check the placement and preservation of on-site materials, analyze the project progress, judge whether the investment of funds is scientific, find potential problems in the simulation process, reasonably set the construction period, adjust the allocation of funds, and guide the actual construction with the model. It will construct a model based on the existing operating system, input information in the corresponding positions, including the corresponding position, name, specifications, etc. of the accessories, and be independently modeled by the system. In the actual construction process of engineering projects, BIM and RFID technology can play an extremely important role in the stages of component production, transportation, entry, on-site management, lifting, etc.

First, most of the building components used in the Prefabricated building project are centrally produced by the assembly manufacturers in the factory after the needs of the construction activities are identified. At this stage, once the component size errors, it will inevitably hinder the smooth development of the subsequent construction activities. At this stage, to effectively ensure the quality and safety of components, RFID coding technology can be incorporated into the construction and production process, through project coding and positional numerical annotation of the construction, this project only takes the construction management of color steel plate hoisting as an example to analyze the application of BIM and RFID technology. To accurately guide the hoisting of color steel plates, the high span section was scanned, and the processed point cloud data was compared with the BIM model to visually analyze the deviation of each section.

According to the actual situation, 83 key nodes such as beams, columns, beams, and slabs are selected for the project, and simulated and analyzed by qualify software. According to the comparison results, the construction method of prefabricated building is different from that of traditional buildings. The main work in the construction phase is to transport the prefabricated components to the construction site in order according to the construction schedule requirements, and then hoist them on the site, complete the construction of the building by installing and fixing components on the construction site. RFID technology is a wireless radio frequency identification technology. The basic technology used in this technology operation is radio wave communication. Unlike communication technology, it does not require the use of optics, machinery, etc. Only the transmission of radio waves can automatically set targets and determine the information contained in the target. In the use of technology, multiple devices are used to cooperate with each other, and the system is used to assist in completing the operation.

The characteristic of its practical use is that it can understand target information without touching objects, and if the surface of the recognized object is covered by other objects, it will not affect recognition. At the same time, it can receive multiple label information at the same time, making information reading more convenient. In addition, the label can be used for a long time without being damaged. It is necessary to

promptly evacuate construction personnel other than maintenance personnel from the maintenance area.

### 2.2 Application of BIM technology in the construction process of Prefabricated building

At this point, to effectively improve the quality and efficiency of staff management work, BIM and RFID technologies can be used to partition the maintenance area, differentiate staff, and ensure that non maintenance personnel can leave the maintenance area in a timely manner. Meanwhile, during the maintenance process, once non maintenance personnel re-enter the area, BIM and RFID technology can also issue an alarm in a timely manner, facilitating the corresponding staff to guide non maintenance personnel to leave the area in a timely manner.

Since most of the components of Prefabricated building are prefabricated in the factory in advance, fully realizing industrial production, to a large extent, it is more guaranteed than the construction quality of cast-in-place components on the construction site, but it is not ruled out that there will be quality defects in the production process of individual components and damage to components caused by transportation, storage, and secondary handling on the construction site. At the same time, due to the non-standard operation of construction personnel and other reasons, the actual project cannot meet the design requirements, thereby affecting the quality of the building. The difference between Prefabricated building and traditional buildings is that the whole construction process is divided into five links, including production, transportation, mobilization, storage, and hoisting. Whether the construction method understands the production speed of components determines the construction progress.

In response to this situation, it is required to carry out RFID management from the perspective of the staff based on various stages of construction. It is not only necessary to strengthen the training of construction personnel before construction to ensure the quality and safety of PC components, but also to strengthen the management of engineering construction during the construction stage. After construction, the construction quality should be inspected to achieve the goal of effectively improving the construction quality. Due to the relatively complex process of engineering construction management, this article mainly takes construction management as an example to introduce the application of BIM and RFID technology. In Prefabricated building, components need to be fabricated in advance, so once design changes occur during construction, prefabricated components will become Construction waste and new components need to be produced at the same time, which will cause the cost of the project to rise; Since the construction process of prefabricated building is divided into five stages: component production, transportation, mobilization, storage and hoisting, and the implementers of each stage are different subjects, the cost management needs to be more refined than the traditional model.

For the prefabrication of the construction, the prefabrication personnel of the factory use the existing reading and writing equipment in their hands to put all information of the components into the chip. According to the user's requirements, the information is encoded in the chip. During the encoding process, rules need to be read and the coding should be scientifically designed according to the content of the rules. Subsequently, the producer puts the prepared chip

into the corresponding system to provide information for subsequent construction operations. Apply RFID technology for regular scanning, and then connect the scanned data to the component material management system in real time and perform point cloud processing. Compare it with the BIM model data information, visually analyze the actual construction site PC component entry, installation, and loss situation, update the BIM model, automatically complete the multi building image progress model, and dynamically adjust the subsequent PC component production in real time.

### 3. CONCLUSION

To sum up, BIM and RFID technology are two advanced and core technologies in the construction process management of modern prefabricated building. Compared with pouring buildings, prefabricated building is more convenient for tag implantation. Real time collection of construction site information through RFID technology and real-time transmission to BIM in the information center. BIM technology provides technical support for prefabricated building construction information update, linkage, transmission and sharing with the characteristics of efficiency, speed, and accuracy. Prefabricated building occupies an irreplaceable position in the construction industry with its efficiency and energy conservation. The organic combination of the two will greatly accelerate the promotion of Prefabricated building in China.

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