The Application of building information management platform in prefabricated building production stage

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Abstract. By studying and analysing the application status of information management platform in prefabricated building production phase, the paper summarizes the management and quality problems of prefabricated building components in the production phase, puts forward the use of BIM technology to simulate the production of components in the prefabricated production chain, and uses the information platform to supervise the production process of components. Based on the problems of prefabricated buildings in the production stage and the characteristics of BIM information platform, this paper analyses that the construction information management platform can bring benefits to participants of prefabricated buildings in the production stage.

1. Introduction
Prefabricated construction projects involve component manufacturers, which increase the supply chain of construction projects and lead to a variety of problems. With the increase of participants, the proliferation of project information and the variety of professional knowledge, the effectiveness of information exchange and sharing cannot be guaranteed. How to solve efficient information interoperability is very critical, and BIM information platform has become the key to solve the problem.

2. Advantages of BIM technology in prefabricated building production

2.1. Problems in prefabricated building production phase
Compared with traditional buildings, prefabricated buildings are not only more convenient for construction, but also can greatly reduce the cost and pollution caused during construction. Therefore, more and more people from all walks of life pay attention to it [1,2]. However, there are various problems in the actual production process of prefabricated buildings. As shown in Table 1.
Table 1. Problems in the application of prefabricated buildings in the production stage.

| Number | The main problem                        | Problem description                                                                                                                                 |
|--------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Asymmetric information exchange        | With a large number of participants, the communication workload is large, leading to poor communication and information confusion, leading to the mismatch between component design and production [3]. |
| 2      | The standard system is not perfect      | In different regions of China, the standards of component products are different [4]. Without a complete system, the component design of prefabricated buildings cannot be truly standardized. |
| 3      | The workmanship is not mature           | The production technology level of pre-stressed components is high, the production efficiency is low, there are quality problems, such as the size of components is not accurate, there are deviation in the position of reserved hole, etc. |
| 4      | Inadequate protection of finished products | After the production of components is completed, it is easy to cause damage to the finished components when stored in the warehouse, resulting in insufficient precision and difficult assembly of components [5]. |

2.2. Characteristics of BIM information management platform

BIM as a kind of integrated construction of information technology, its biggest value lies in the management of information and the use of prefabricated components into production after the design, can be achieved by using BIM technology by design drawing or model to the shift of prefabricated processing model, for processing components of production materials in the process of processing components, implementation artifacts docking site production simulation and CNC machining equipment to realize the automation and digitization of artifacts [6]. As show in Fig. 1, the whole project life cycle scheme comparing.

Management in the late components production and transportation process, the surrounding information management platform and Internet of things technology realizes the informationization and the depth of the fusion of industrialization, the detailed structure of the process as shown in Fig. 2 of the application of BIM technology in prefabricated construction production stage, is advantageous to the effective control of materials, equipment, the use of reasonable processing sites at the same time, improve the level of factory automation production at the same time, improving the quality of production component, to speed up the work efficiency, convenient component production management [7].

Figure 1. The application of BIM information management platform in the whole project life cycle.
3. Application of BIM information management platform in prefabricated building production stage

3.1. Prefabricated component processing model

On BIM information management platform, in the component processing stage, the designer upload designs to platform, component producers of prefabricated deepen design units to provide prefabricated information model including the complete design information deepening, and add the necessary information required for the production of processing and transportation [8], production process such as production order production time location of the temporary storage area, form a line build prefabricated processing information model of production management information platform designs, including component model drawing form documents, such as the model information is extracted and updated, with the aid of BIM model and cloud platform realize information transfer from design to component processing.

3.2. Prefabricated component mold design

Mold design processing unit based on the mould of prefabricated component BIM model of digital design, namely the component BIM model has been built on the basis of its peripheral components die mold design artifacts of fine degree determines the component production scale, production scale component determines the accuracy and feasibility of the components are installed using BIM technology, used has already built prefabricated BIM models provide mold design components need 3 d geometry data and related auxiliary data, realize the automation of mold design [9, 10]. And using the correlation of BIM simulation software for simulating the rationality of the mould disassembly sequence, and combined with prefabricated automated production line, realize the automation of model joining together when the mold size data or assembling sequence changes, mold designers need
to modify the relevant data, and updated in real time adjustment and optimization of the model, to solve the problem of the fine degree of the artifacts from the source.

3.3. Prefabricated component material preparation

Based on the BIM model and the BIM cloud platform, the component manufacturer extracts the parameters of each component in the structural model, and makes use of the functions of the BIM cloud platform and the automatic statistical component list in the model to conduct statistics on different components and determine the material reports required by the factory for production and on-site assembly. In terms of the specific amount of materials, according to the details of the component processing after the deepening of the design to determine the type of reinforcement, work, concrete number, amount, size of the mold, size, material, embedded parts, equipment pipeline number, type, specifications, etc [11, 12]. BIM technology can also be used to simulate the demand for manpower, materials and equipment in the component production stage, and determine the material demand plan for materials and materials based on the data and information, as well as further determine the material procurement plan. On this basis, further develop the cost control objectives, the production and processing of the cost of fine control. Extract data by the BIM platform for management is applied to the analysis of material purchasing and storage plan, provide material supply unit, also can be used as a component of information data review, and according to the actual situation of component production, design units of the component information feedback to realize and artifacts from the production side, the material supplier information between seamless docking, increase the degree of component manufacturing informatization.

3.4. Industrial processing equipment selection

3.4.1. Selection of concrete supply equipment. Concrete supply equipment of pre-stressed structure should include concrete mixer, conveyor, draping machine and other equipment, concrete requirements have higher workability and uniformity, more stable degree of collapse, so the choice of coagulation mixer type of main engine to meet the characteristics of pre-stressed concrete, such as the choice of double horizontal shaft mixer. Walking routes with BIM technology to simulate the concrete supply equipment to make it conform to the requirements of the site planning, through simulation of concrete supply throughput BIM technology, ensure the integrity of the process flow and continuity, concrete mixing and from the concrete mixing station to the concrete cloth machine, the process of transmission through the manipulation of the chamber and control platform operation control walking in a particular orbit. The concrete is then poured evenly and quantitatively into the component model by a console or remote control.

3.4.2. Steel bar processing equipment selection. The degree of industrialization of pre-stressing prefabricated buildings depends largely on the level of mechanization of steel processing. Through BIM technology simulation of the process of steel bar processing, the integrity and continuity of relevant work such as subsequent steel bar engineering can be guaranteed, and the phenomenon that is not conducive to construction organization such as work idling and unreasonable stacking of materials can be reduced. Steel bar processing equipment mainly includes steel bar straightening and cutting equipment, automatic bending and bending equipment, steel bar welding and welding network equipment.

3.4.3. Component maintenance and in-plant transport equipment. The component curing area is equipped with a steaming kiln. During the curing process, the temperature and humidity in the kiln are controlled by the temperature control system of the curing kiln, and the component steaming and curing is completed through the process of heating, keeping a constant temperature and cooling. The vibrating concrete components are transported to the steaming kiln, and the prefabricated components after curing are transported from the steaming kiln to the demudding position of the components of the production line. In the later stage of the production process, after the component is demaged, it shall be equipped with a rollover equipment that can roll the component from the horizontal state to the
vertical state for easy hoisting and transportation. After the rollover, the finished pre-stressed component shall be transported from the production workshop to the storage yard through the conveyor equipped with automatic cable retraction and releasing system. All equipment transported in the plant is simulated by BIM technology, including the placement of equipment, the coordination of equipment walking path and equipment after component production, component movement and stacking, etc.

4. Conclusion

This article discusses the research on production of prefabricated model add processing components necessary information required for the production of transportation, thus forming a prefabricated processing model, and with the aid of BIM platform and component model of prefabricated reinforced concrete mold processing required materials such as demand analysis, for the processing of the prefabricated material preparation, not only from the prefabricated construction of informationization platform to achieve cost savings, improve management efficiency, increase in information flow, improve the lean production, more from the perspective of informatization construction to solve the problems in the development of prefabricated construction, which reflects the characteristics of information industrialization.

5. Acknowledgments

This work was financially supported by Tianjin Municipal Education Commission Major Project (NO. 2016JWZD22).

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