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Research on Construction Technology of Prefabricated Structure Based on BIM Technology

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Abstract: Building information modeling (BIM) technology simulates visual information data by integrating the information data of construction projects. The presentation of information parameters allows better collaborative management of the construction process. BIM technology is applied to integrate information data during the construction of prefabricated structures, analyze the source of information data of construction projects, and build a digital information model. BIM technology consists of information integration function, information data simulation, cross-region coordination and more. Therefore, this paper applies it to the process of prefabricated structure design, puts forward relevant technical research strategies, establishes relevant models, ensures the accuracy of drawing, and simulates the final construction effect according to the combination of arranged relevant parameters.

Keywords: BIM technology; Fabricated structure; Construction technique

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1. Introduction

With the implementation of energy protection strategy and environmental protection issues, the overall development requirements of the construction industry are more stringent. The fabricated structure reflects the characteristics of high-quality engineering quality, strict and accurate cost control, which can effectively reduce the energy consumption in the overall construction of the construction industry. It is an environment-friendly building model. With the application and development of fabricated structure, the whole shows certain defects [1]. The issue of long construction period and difficult construction of the project occur frequently. In addition, the project cost has increased significantly, and there has been excessive waste of resources. The traditional construction technology is gradually replaced by the high-quality prefabricated building structure [2]. Based on the above difficulties, applying BIM Technology to the process of prefabricated structures can effectively reduce the original defects of prefabricated structures and increase the quality of prefabricated structures. It is necessary to constantly study the characteristics of BIM technology, enhance the application effect of fabricated structure, reduce material resource waste and pollution, and effectively improve the overall application efficiency [3].

1.1. Introduction of BIM technology

BIM technology is a type of information technology that builds digital information modeling based on building information. Based on the integration of various information and data of the construction project, the information is simulated into visual information data through digital technology, which is combined

with three-dimensional model and database to form a comprehensive model. BIM technology presents various building information in the form of parameters through model construction, which is convenient for construction workers to analyze, manage, coordinate and control the construction process, so as to improve the professionalism, reliability and accuracy of construction. As for the construction of fabricated structures, BIM technical data is used to comprehensively control the information of the construction project, optimize the design scheme, construction technology, accessories and facilities, and manage the whole process of the construction site. In addition, by improving the rationality of building indicators, we can improve the quality and efficiency of building construction [4]. Through the application of BIM technology, integrating the data information related to the construction, analyzing various information required for the construction of the construction project, and building the relevant digital information model, the simulation model of the whole construction project can be formed. BIM technology mainly presents the main functions of coordination, simulation and optimization. Based on the overall characteristics of BIM technology, according to the actual construction situation, the layout of construction personnel can be optimized, and the construction of parts prone to collision can be adjusted during the construction process. In addition, the construction method is improved by simulating the construction process. BIM Technology can create drawings and mark key points of building construction to select appropriate building construction methods [5] to conduct risk analysis on the formed building model to ensure the safety and reliability of building construction, prevent possible accidents in building construction and reduce the incidence of emergencies.

2. Application of prefabricated structure construction technology based on BIM technology

(1) The combination of BIM technology and construction simulation.

According to the construction scheme of building structure, we can quickly formulate effective engineering solutions. Before implementing the construction scheme of the prefabricated project, BIM technology can be used to conduct comprehensive dynamic analysis and simulation of the construction process, so as to timely find the possible quality problems in the whole process [6]. It is necessary to use BIM technology to build the prefabricated bridge engineering model system, optimize the specific modeling parameters of the prefabricated bridge engineering components, and simulate the bridge engineering and construction work more accurately. In the simulation of the hoisting construction process of prefabricated bridge components, the whole process of design and construction can be directly simulated in combination with the hoisting process planning. It can formulate and provide reasonable guidance for the implementation of subsequent hoisting construction. In the process of final assembly design, it is necessary to consider the influence of various technical factors such as the rotation of tower crane components, the range of curvature radius, transportation speed, operation route and so on, so as to ensure the perfect connection of various technical factors [7]. By simulating the size and construction work of the main components of the bridge, the process defects in the existing construction plan can be detected the existing plan can be improved. In the construction of hoisting engineering, material transportation, loading and hoisting are important nodes of prefabricated bridge engineering. The radius of rotation of tower crane equipment, the expansion and reinforcement of loading site facilities, and the optimization of material transportation vehicles are important because the transportation route affects the layout and management of the construction site, thereby affecting the overall construction operation [8]. Based on the optimization of these key nodes, the construction links in the whole installation and construction process are closely coupled to ensure efficient installation and construction. The construction unit should utilize BIM technology, quickly establish a scientific and complete construction site model, and conduct a detailed and reasonable quantitative analysis of the data such as the use of construction materials on the project site.

(2) Improve the accuracy of prefabricated parts production.

There are limitations in the conventional design method, which cannot accurately and comprehensively present the information of relevant parts, which subsequently brings inconvenience to the subsequent prefabrication construction and directly affects the installation progress. In order to effectively improve the production quality of prefabricated components of prefabricated buildings, it is necessary to introduce BIM technology, establish BIM model of insulation wallboard, internal reinforcement layout of prefabricated components, prefabricated electromechanical pipelines, prefabricated embedded parts, and more. The optimization of components and the overall accuracy of the design ensure the quality and efficiency of the subsequent processing and production of prefabricated components [9]. In the actual production and processing of prefabricated components, manufacturers can obtain the specific processing information of prefabricated components according to the BIM model of prefabricated buildings, and process and produce according to requirements to ensure the maximum utilization of resources. In the actual development and construction of prefabricated construction projects, a large number of prefabricated components must be processed and manufactured in factories. In the production process of prefabricated components, the corresponding prefabricated components according to the construction progress of prefabricated buildings must be manufactured and produced in time, so as to reduce the cost of prefabricated site therefore reducing construction cost. In order to achieve the expected construction goals, BIM technology should be applied. Besides, with the support of BIM model, the production process of prefabricated parts must be optimized, and the cooperative factories must be guided to strictly implement the production plan. Prefabricated construction projects must use prefabricated components, and they must be processed and manufactured in an orderly manner to ensure overall development. When comparing traditional construction projects with prefabricated construction projects, it can be seen that during the development and construction of prefabricated building projects, prefabricated components are installed in a standardized way. It is also crucial to use professional machinery and equipment in the actual installation stage of prefabricated parts [10]. In order to effectively improve the feasibility and efficiency of the overall development of prefabricated buildings, it is necessary to apply BIM technology, constantly optimize the construction scheme of prefabricated buildings, and effectively improve the overall installation efficiency of prefabricated components.

(3) Coordinate professional designing systems with other professional teams.

BIM technology incorporates digital information technology to generate an analog information system combining water collection, heating and electricity. Professional designers and other professional teams need to be coordinated through the analog information system From the perspective of construction companies, structural engineers, manufacturers, and equipment engineers, BIM technicians have changed the original traditional way of use. With a professional designing system, architectural designers can obtain the relevant required information and add its specific information to the actual work. According to the information prompt of the simulation system, we can work with the same parameters as the basic building model [11]. BIM technology is combined with professionally coordinated design, specific work content, shared work information, therefore increasing the efficiency of work progress. The application of BIM technology is conducive to the rationalization of building structure design, ensures systematic progress of construction plan, and effectively improves the quality of the building. By converting the BIM model, according to the specific location of the internal components, we can select the appropriate number, install the corresponding equipment, and test internally. If there are any abnormalities during the selection of equipment data information, the overall structure of the building can be ensured by debugging the overall design parameters. In practice, BIM technology is used to build the model, plan the data measurement information, adjust the model, control the stability of the building, as well as increasing the structural strength of the building. Through the application of BIM technology, building structure design

is combined with various on-site data analysis functions to analyze the overall design process of the model and improve the measurement accuracy of building land and surrounding ecological environment information. When natural disasters occur, we can enter the BIM data information system, and the specific disaster information can clearly appear in the database. When the environment changes rapidly, the BIM data feeds back relevant information, and the basic performance indicators of the model structure meet the expected requirements. BIM technology can effectively strengthen the stability of building structures in the early stage of design. In the process of data testing, in order to make the local climatic and geographical conditions better meet the needs of the building, the safety and service life of the building can be effectively achieved through the coordination performance of BIM technology [12]. Architects combine BIM tools and methods to simulate different structural design situations and make judgments on site conditions. According to the preliminary concepts and standards, the building structure design can better integrate ecological factors. Designers use the relevant performance simulation analysis software to analyze the annual sunshine duration and shadow changes of the construction site, so as to provide the basis for specific construction.

(4) Scientific management of construction progress.

The application of BIM technology in site schedule management can effectively simulate the layout and dynamic adjustment of the site, make the loading and transportation of fabricated components scientific and reasonable, and also ensure the construction safety. The construction period of prefabricated construction is shorter than that of conventional construction projects, and the construction efficiency is high. The application of BIM technology can effectively highlight the construction progress advantages of prefabricated construction projects [13]. This is mainly because BIM technology can improve construction schedule management. In the construction of prefabricated construction projects, BIM technology can effectively formulate the construction progress of each work phase, and relevant personnel can analyze the construction situation scientifically according to BIM model and on-site construction monitoring. Systematic planning the human resources and capital investment of the plant can not only ensure optimization of the installation of components, but also deal with the differences in construction technology [14]. The construction engineer must apply BIM technology to simulate the difficulties in construction, detect existing problems in the project, and ensure the smooth progress of construction. In addition, this method can also effectively prevent the waste of building materials, thereby reducing construction costs. The construction workload of prefabricated construction engineering is large, and it often consumes a lot of building materials. Therefore, this makes it difficult to ensure the timely supply of materials when managing building materials in the traditional way. Any damage of breakage of materials during the construction process will be detrimental the construction progress of the project. In the specific application of BIM technology, the construction process must be comprehensively calculated and analyzed, and based on this technology, the construction materials and construction progress must be scientifically and reasonably managed, so that it can meet the construction needs of the project. The materials can be adjusted to ensure uninterrupted supply. In addition, BIM technology should also be used to find abnormal problems of material loss in time in order to make an effective judgement on material loss, so as to improve and optimize the construction stage.

(5) Optimize the construction technology and arrange the scheme reasonably.

In the process of building construction, the splitting process of columns, beams, slabs and other components is created and transported according to the actual situation. In the process management of prefabricated parts on site, BIM technology can be used to optimize the construction process, and BIM technology model can be used for integrated design. The production, construction, management and installation of prefabricated integral components are effectively connected. The final design and construction can be carried out at the same time by defining the construction period and schedule and

presenting the components of the whole building through digital technology simulation. With the help of BIM technology, it can realize the informatization of engineering buildings, ensure the sharing of engineering quantity information and data, ensure the visualization of various assemblies, and facilitate the inspection of each connecting node. BIM technology can effectively simulate site conditions and construction plans, and easily select the best construction site, construction plan and construction procedure [15]. According to the industry standards and technical requirements and the project implementation, we can clarify the construction scheme, design, optimize and determine the construction scheme, and use the BIM model to test the feasibility, reliability and integrity of the scheme, find various construction problems, and provide reference for design drawings.

3. Conclusion

In conclusion, the application of BIM technology in the construction process of fabricated structures gives full play to the advantages of BIM technology, improves the construction efficiency of construction projects, shortens the construction time of construction projects, and optimizes key construction nodes. In construction simulation, parts and equipment, construction management, carrying out construction supervision according to specific models can improve the quality and efficiency of the project. The application of BIM technology promotes the development of prefabricated construction engineering and improves the overall utilization of resources. The application of BIM technology in the construction of prefabricated building structures effectively improves the production quality of components. At the same time, through the simulation of the construction site, a reasonable construction scheme is formulated. Lastly, planning the existing buildings on the construction site provides technical support for the development of the construction industry.

Disclosure statement

The authors declare no conflict of interest.

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