Application of BIM Technology in construction quality management

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Abstract: *because the traditional construction quality management methods cannot deeply solve the problems in the drawings, resulting in the poor effect of engineering construction quality management, this paper studies the application of BIM Technology in construction quality management. Visually process the visual blind spot area by verifying the architectural design drawings. Simulate construction operation based on BIM and share quality information. Dynamically control the construction site through the whole process construction quality management. Through the application effect analysis, this method has effectively solved 96 collision conflicts and 53 hidden dangers of construction quality. Compared with the traditional method, it is found that this method saves the construction period of 21 days and improves the construction efficiency, which proves that this method is reliable.*

Keywords: *BIM Technology; Quality Assurance; architectural engineering; Design drawings; Technical disclosure; Collision detection*

1. Introduction

In the construction of construction projects, the quality problem has always been a concern in the industry. In recent years, the quality problem of construction has caused a series of accidents, which has seriously affected people's daily life and the orderly development of society, and posed a certain threat to personal safety, which means that there are still many deficiencies in the project quality management of construction in China, It needs further optimization and breakthrough [1]. In order to improve the quality and efficiency of construction projects, this paper applies BIM Technology to the traditional construction quality management mode, organizes and coordinates various disciplines and systems, and provides scientific decision-making basis for construction projects. As a modern information technology means, BIM Technology can realize the fine management of construction project quality through dynamic data management, and further optimize and reform the production mode of the construction industry [2]. In order to reduce the pressure of construction quality management personnel and improve the efficiency of construction project construction, this paper applies BIM Technology to quality management according to the quality problems of construction engineering, which provides a certain reference basis for construction engineering enterprises, and is of great significance to accelerate the development of informatization process in the construction industry.

2. Application of BIM Technology in construction quality management

2.1. Verification of architectural design drawings

During construction, in order to ensure the project quality, the design drawings need to be verified. BIM Technology is applied to the drawing verification to make the drawing review visible. All participants comprehensively consider their spatial relationship through BIM model, and review the complex design based on professional knowledge through three-dimensional visual management, It can find out the problems in the drawings in time, and find the blind spot areas that are easy to be ignored visually through the combination of intelligent software and BIM Technology, so as to improve the design structure of the design drawings [3]. Firstly, the model in each drawing is reviewed and modified according to the design drawings, and the problems found in the review are summarized. All participants discuss and find solutions, optimize and change the drawings, and reconstruct and modify the model. The visual management of BIM model can accurately locate the location of quality problems, deepen the design of building structure and electromechanical system, visually process the

drawings of various disciplines and systems, and carry out collision detection. It is found that there are 39 collision points in all drawings. The conflicts between systems and disciplines shall be handled to ensure that the drawing design is scientific and reasonable.

2.2. Simulation of construction operation based on BIM

In the construction based on BIM Technology, its construction and construction process can change the construction mode of traditional building engineering through the simulation of building construction. The process of traditional building construction is formed at one time. Therefore, it is difficult to solve the conflict of resource scheduling and the unreasonable use of various disciplines and systems, and its building construction often has quality problems. Based on BIM Technology, this paper carries out construction simulation, uses different construction methods and processes, compares and analyzes them, simulates construction processes, simulates resource scheduling, etc., which can find conflicts and problems in time, so as to optimize and avoid errors in the construction process [4]. In order to ensure construction quality and share quality information, a quality information management system is established through the management platform to display the number of components in real time and the installation progress. BIM Technology is used for quality management of projects with large overall span, sensors are used during construction, anti-collision system is installed, the direction of construction movement is judged and warned, and real-time monitoring is carried out.

2.3. Whole process construction quality management

Based on BIM Technology, through the quality management platform, intelligently identify construction personnel and building entities, track, detect and manage equipment, machinery and building construction, and connect each component of the construction site to the BIM model to realize fine management [5]. Project implementers use the quality information management platform to organize, coordinate and distribute resources. The construction personnel input the real-time relevant data of the project into the system, connect the BIM model with the project quality detection information, dynamically monitor and manage the construction site, and can obtain the construction quality information in time. Through the visibility characteristics of BIM, the pre embedding of components can be done in time during the construction process, so as to avoid the rework of quality problems after the completion of later construction, so as to achieve the purpose of prior construction quality management. In the construction of construction projects, the reinforcement structure is complex, and errors are easy to occur in some node positions. Therefore, it is necessary to arrange and arrange the reinforcement more reasonably. During the construction, in order to ensure the high accuracy of each component, the setting out of reinforcement shall be carried out accurately and each construction node shall be determined. In the process of quality management, the management personnel take pictures of the construction site through camera equipment, connect the location information with quality problems to the BIM model, deduce the model, analyze the causes of the problems, and assist the smooth progress of construction quality management.

3. Application effect analysis

The total construction area of this project is 125639m2 and the total height is 150m. The main building includes office and conference room on the ground. The basement is parking lot and electromechanical machine room. The installation of engineering electromechanical system is complex, including building electrical engineering, water supply and drainage engineering, etc. This paper applies BIM Technology to architectural design and electromechanical installation quality management, simulates construction operation through BIM Technology, arranges and arranges the site and construction equipment, further optimizes and adjusts the layout scheme of construction machinery, and realizes the construction quality management of construction engineering based on BIM Technology. In order to verify the effectiveness of this method, the construction period of the machine room is compared and analyzed. Before the equipment in the machine room enters the site, the equipment is modeled according to the manufacturer's data, and the manufacturer is provided with technical disclosure to ensure that the model is consistent with the equipment. After determining the equipment installation position, the pipeline construction is carried out in advance. During the deepening process, the management personnel consider the manufacturing of pipes, pipe fittings and accessories in advance, Most materials are manufactured and processed in advance in the factory to

complete the installation of the machine room. The comparison of installation progress and construction period of machine room is shown in Table 1.

Table 1 Comparison of machine room installation progress and construction period (days)

Serial number	Construction procedure	Traditional time	BIM time
1	Data collection of equipment in machine room	7	7
2	Machine room equipment drawing deepening	12	15
3	Formwork erection, pouring and curing of equipment foundation	30	30
4	All equipment in the machine room shall be transported to the machine room in place	14	10
5	Installation of pipeline, valve and instrument of each system	60	40
Construction period		123	102

It can be seen from table 1 that through the construction method in this paper, the construction period is saved by 21 days and the efficiency of construction and installation is effectively improved. At the same time, this paper optimizes the construction process, reduces 2012 pieces of ground overhead floor, saves 150m2 materials and shortens the construction period by 35 days. In the collision inspection, there were 101 problems and 96 problems were effectively solved. Through BIM Technology, 56 potential quality problems were found in the construction. The quality problems were summarized, and specific correction schemes were formulated for common quality problems to solve 53 potential problems, so as to ensure the smooth completion of the project. To sum up, the application of BIM Technology to construction quality management in this method has significant effect, saves the construction period and construction materials, avoids rework to a large extent, ensures the construction quality, and proves the reliability of this method.

4. Conclusion

In this paper, BIM Technology is applied to construction engineering construction from three aspects: verification of architectural design drawings, simulation of construction operation based on BIM and whole process construction quality management, which realizes the quality management of construction in advance, during and after the construction, effectively improves the construction quality and obtains certain research results. At the same time, due to the limitation of time and conditions, there are still many deficiencies in this paper, which need to be further discussed in the future research. For example, this paper does not involve the research on the identification of potential risks, and the application of quality management in the construction stage needs to be continuously optimized and improved in the future practice. In the future research, the construction of potential risks identification system will be considered, Make the construction quality management of construction engineering more scientific and efficient.

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