Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
September-October 2022 Page No. 317-323
Article History: Received: 05 April 2022, Revised: 27 April 2022, Accepted: 03 May 2022, Publication: 14 May 2022

Research on the Application of BIM in the Quality of Intelligent Building Engineering

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Abstract:

The construction quality of construction engineering directly affects the service life of engineering projects and the safety of people's lives and property. As a new construction site management technology based on building information model, BIM Technology is increasingly widely used in construction engineering. By combining BIM Technology with construction quality management of building intelligent construction, through studying relevant literature Qualitatively compare the advantages of BIM Technology construction quality management and traditional construction quality management, Combined with engineering practice experience, based on the analysis of the key points and difficulties of construction quality control of building intelligent construction, this paper systematically analyzes the specific application of BIM Technology in the management of on-site quality factors and on-site technical quality of construction intelligent construction, and explains its application effect.

Keywords*: BIM technology, Intelligent building construction, Project quality management.*

I. INTRODUCTION

Intelligent construction refers to making full use of intelligent technology and related technologies in the construction process, improving the intelligent level of the construction process, reducing dependence on people, achieving the purpose of safe construction and improving the cost performance and reliability of the building through the application of intelligent system. BIM Technology [1] is a data-based tool applied to engineering design and construction management. It integrates relevant information of various projects through parameter model, and shares and transmits it in the whole life cycle of project planning, operation and maintenance, so that engineers and technicians can correctly understand and respond to various building information efficiently, so as to provide a basis for collaborative work for the design team and all construction subjects including construction operation units, So as to improve production efficiency, save cost and shorten construction period. The following describes the application of BIM in engineering quality management in building intelligent construction from two aspects.

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II.BIM'S MANAGEMENT OF FACTORS AFFECTING SITE QUALITY

The factors affecting the project quality include human, machine, material, method and environment [2]. Reducing the influence of these five aspects will greatly improve the on-site project quality.

2.1 Management of Human Factors

Human factors play a decisive role in construction quality management. The application of BIM Technology can simulate the whole construction process, so that the on-site managers and construction operators can fully understand the quality implementation points of various processes and key quality control points, enhance the quality and safety awareness of all participants in the project, and give full play to people's leading position in engineering construction quality management [3]. Project managers have an intuitive understanding of the construction site in advance through the multi-dimensional information model of BIM, analyze the possible quality problems in the process of project construction in advance, judge the key points and difficulties in project operation, and reduce the impact of uncertain factors on project quality; The construction workers can use the visual interface of BIM Technology to preview the construction tasks in advance, clarify the construction points, grasp the construction technology, and master the quality control methods of key nodes, so as to avoid the quality problems caused by subjective errors.

2.2 Management of Materials and Machinery

2.2.1 Engineering materials are the basic raw materials constituting the engineering entity.

The quality of materials directly affects the quality of the project. The management of materials is the foundation of engineering construction quality management. BIM technicians input the material information required by each part of the project into the model to form a huge database, which can effectively plan the material inventory, view and manage the material consumption in each construction stage. Before the materials enter the site, use the parameter information of the materials in the BIM model to accept the materials of the supplier and inspect them from the source, so as to ensure the construction quality of the project to the greatest extent.

2.2.2 The reasonable selection of construction machinery is an important guarantee for the smooth progress of the project.

BIM Technology is used to simulate the construction process, timely find the problems such as crossing, interference operation and construction blind area that may occur in the actual construction, and adjust and optimize the construction scheme in advance.

For the mobilization and site layout of large construction machinery and equipment, BIM Technology can also be used for site simulation and layout in advance, and the three-dimensional visual interface can

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be used for display. Based on the principle of high efficiency and economy, different construction machinery combination schemes can be compared and analyzed, and the optimal layout scheme suitable for the on-site construction environment and construction technology can be selected. For example: model, maximum lifting height, maximum amplitude, quantity and station car position of tower crane.

2.3. Environmental Management

The factors affecting the construction site environment mainly include the natural conditions of the construction site, construction operation environment and construction quality Quantitative environment [4]. In the construction preparation stage, by adding external environmental factors such as geographical conditions and climate conditions to the BIM model, and through the impact of the site natural environment on the construction process in advance, the quality risk can be reduced or eliminated. In the project construction stage, the three-dimensional roaming and visualization platform of BIM Technology is used to dynamically track the processes and sub projects on the construction site, grasp the situation of the construction site in real time, and provide a guarantee for the construction quality of the project (as shown in Figure 1). In terms of construction quality environment, all participants of the project communicate and coordinate under the same platform based on BIM Technology, which can better realize information sharing and collaborative work, effectively solve the problems of low informatization and poor information communication of traditional construction quality management, and ensure the construction quality of the project.

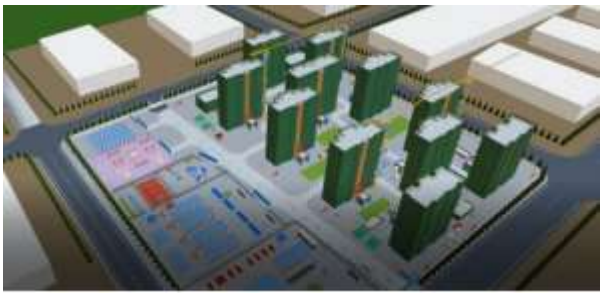

Fig 1: Three dimensional roaming of BIM

2.4. Management of Construction Methods

The construction method includes construction scheme, construction technology, construction organization design and construction technical measures. Benefit Different construction schemes are simulated and demonstrated with BIM Technology to select the best scheme. At the same time, the deviation between the construction plan and the actual implementation shall be monitored and corrected in time. In addition, BIM Technology also provides a common visual and parametric information platform for all participants of the project. All parties of the project communicate and work together through this platform to find and solve the problems that may be encountered in the process of quality management in advance. There is also the information model based on BIM Technology. Using on-site three-dimensional scanning equipment and mobile terminal equipment, managers can record and count the data on the

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construction site. In this way, while monitoring the effect of the construction site, they can avoid unknown quality risks. Finally, after the project is completed, the information in the model will be sorted into a database for reference and borrowing of similar projects in the future, so as to realize the traceability of project information [5].

III. BIM'S MANAGEMENT OF ON-SITE TECHNICAL QUALITY:

3.1 Carry out Technical Disclosure to Ensure Project Quality

The purpose of construction technical disclosure is to enable the on-site construction personnel to have a detailed understanding and understanding of the project characteristics, technical quality requirements, construction methods and safety, so as to facilitate the scientific organization of construction and safe and civilized production. Using BIM for construction technical disclosure can better show the sequence and key sections of project construction Point technical requirements to make the construction process more logical. During the disclosure process, the construction personnel carried out visual construction rehearsal and animation simulation of the project's construction scheme and construction technology in the BIM three-dimensional model, and made the whole disclosure simple, clear and accurate through the disclosure method of multi angle and omni-directional viewing and rehearsal of the model, which greatly improved the quality of Engineering technical disclosure and avoided the quality problems and potential safety hazards caused by workers' misunderstanding.

3.2 Detect Collision and Reserved Holes and Find Problems in Time

Engineering construction is a complex and dynamic process. Affected by many disciplines and limited space, components, equipment, machinery and structures often collide with each other. Collision inspection is to check the drawings before the project construction, so as to find out whether there are conflicts and contradictions within and between disciplines, adjust and optimize the conflicts and contradictions, and obtain the optimal model.

The collision inspection based on BIM Technology can put all disciplines in the same model in advance, comprehensively inspect and simulate the coordination of disciplines through the collision detection system, and then quickly and effectively find the collision point in the corresponding BIM model and give the collision inspection report. BIM Technology can find the inconsistency between the design and the actual situation in advance before the project construction, reduce the rework, change and other problems caused by design errors, and improve the management of construction quality [6]. (as shown in Figure 2)

In the construction and installation engineering, the accuracy of hole reservation position plays a very important role in the installation of electromechanical equipment. Problems such as inaccurate reserved position or wrong size of holes, misplaced or missing holes and poor connection of holes will have an impact on construction quality, construction progress and subsequent processes. Using BIM Technology

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can avoid the above problems to a great extent, ensure the location and quality of the actual reserved holes in the project, and improve the construction efficiency. At the same time, in the later stage of the project construction, if there are problems such as the calculation error of the engineering shear wall or the wrong opening position, the BIM Technology is used to continuously adjust the hole location on the three-dimensional model and re determine the correct position of the hole. (as shown in Figure 3)

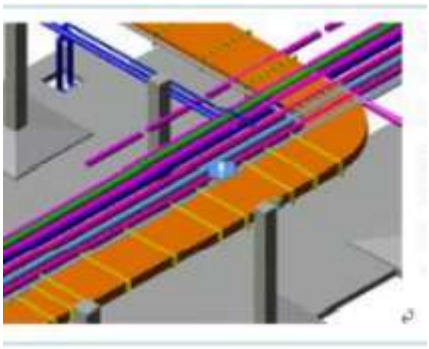

Figure 2 collision inspection

Figure 3: Simulation of reserved opening

3.3 Simulate and Optimize the Special Construction Scheme to Improve the Feasibility and Applicability of the Scheme

The special construction scheme refers to the document prepared separately for the divisional and subdivisional works with complex technology and high risk based on the construction organization design, which is used to guide the technical management of on-site construction. It is the deepening, refinement and supplement of the construction organization design in this specific work.

When BIM Technology is applied in the arrangement of special construction scheme, materials can be added to the model Characteristics to verify whether the materials meet the quality requirements of the project. At the same time, the construction parts with new processes and technologies can be simulated and demonstrated with three-dimensional models to find out the difficulties in the construction process intuitively and vividly, with necessary text descriptions, so as to enhance the practicability of the special construction scheme [7].

3.4 Design Change is Faster and More Convenient

Engineering construction is a dynamic process. In the construction stage, some contradictions, errors and conflicts of design drawings are often encountered, and design changes are required. The submitted written change application must be approved by the supervision unit and the owner, and then reviewed and redesigned by the design unit. After all parties agree on the change and sign in writing, the construction unit will organize the construction according to the change drawings. The whole change process is complex and long cycle. It is easy to delay the construction period and increase the cost.

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For the design change based on BIM Technology, the design unit only needs to modify the parameters of the original model, and the software will automatically associate with the file data of the design model according to the changed parameters, establish remote update and regenerate the model. Reduce the information transmission and interaction time between the design unit and the owner, contractor and supplier. The owner and the supervisor can quickly check the rationality of the change by comparing the models before and after the change. After the change, new construction drawings can be automatically generated by BIM related software and fed back to the construction site in time for on-site construction.

3.5 Carry out On-Site Quality Tracking Management

The quality management of the construction site is the guarantee of the construction quality of the whole project. The in-process quality management based on BIM Technology is to directly guide the on-site construction by using the BIM model, measure and detect the actual situation of the construction site by using the three-dimensional scanner and mobile terminal equipment, and transmit it to the associated BIM model for comparative analysis, so as to feed back the quality problems found to the on-site managers in time, so as to realize the real-time management of the construction site.

3.6 Real Time Management of Construction Data

From construction preparation to construction to completion acceptance, there are a large number of engineering materials in each stage of the project. These materials are generally stored in paper documents. Sorting them out is not only time-consuming, labor-consuming and inefficient, but also cannot guarantee the real-time and accuracy of these materials. BIM Technology is used for construction data management. All participants of the project need to record the actual situation of the project construction in the BIM model in real time. After entering, these data will be stored in the form of data in the corresponding location and associated with the BIM model. After the project is completed, the information in the model will be sorted into a database for reference and borrowing of similar projects in the future, so as to realize the traceability of project information.

IV. CONCLUSION:

To sum up, BIM Technology can improve many problems existing in traditional construction quality management, improve project quality and work efficiency. The extensive application of BIM Technology in intelligent construction can promote high-quality, refinement, intensive and efficient, intelligent development, green and low-carbon, scientific and technological innovation, use intelligent operation and maintenance means, digitally empower the construction industry, and help the transformation and upgrading of the construction industry.

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