

Application Strategy Analysis of BIM Technology in Construction Engineering Safety Management

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Abstract: modern information technology is widely used in construction projects, which promotes the efficiency and quality of construction safety management to be significantly improved. BIM technology promotes the effective implementation of project safety management. It has many advantages: accurately identify the risk sources in construction projects, further optimize the construction site layout, and avoid some unexpected accidents, So as to improve the quality of construction engineering safety management, and then promote the healthy development of the construction industry. This paper analyzes the application of BIM technology in construction engineering safety management from several aspects for reference.

Key words: BIM technology;Construction works;Safety management;Collision; construction organization

As a technology that has been deeply applied in construction engineering, BIM technology applied in the safety management of construction engineering can prompt the industry to avoid safety accidents to the maximum extent and guarantee the orderly development of all aspects of construction with the advantages of modeling, visualization and three-dimensional simulation,. Therefore, in the specific application process, the relevant enterprises should scientifically apply BIM technology, give full play to its functions, continuously improve the safety of construction projects and improve management efficiency.

1 BIM technology overview and application characteristics

1.1 Overview of BIM technology

BIM technology belongs to three-dimensional visualization digital model technology, which constructs three-dimensional model based on engineering data, and uses information technology to simulate the actual construction situation of construction project, so as to realize

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the whole process management. BIM technology can organically combine the visualization mode with 3D technology, identify the possible unknown factors by simulating the actual operation of Construction Engineering in safety management, and promote the construction personnel to avoid the possible safety problems in advance. Therefore, the application of BIM Technology in safety management is conducive to the construction personnel to find potential safety problems, and take corresponding measures to solve these problems in time, so as to significantly improve the safety management level of construction projects.

1.2 Application characteristics of BIM Technology

First, the characteristics of visualization. When BIM Technology is applied to the safety management of construction projects, the most significant feature is visualization. The main visual features are that with the help of BIM Technology, the building can present a three-dimensional model, and the construction personnel can accurately grasp the size and characteristics of the building through the three-dimensional model. Compared with the two-dimensional model, the three-dimensional model can present the details and data to the construction personnel in detail, especially when managing buildings with complex structure, the construction personnel should give full play to the visual characteristics of BIM technology. At the same time, the information model built by this technology can enable the management personnel to have a more comprehensive understanding of the whole construction project, So as to avoid safety accidents to the greatest extent.

Secondly, the characteristics of simulation. In construction engineering, because the safety management is difficult to predict, each link involves many factors. Building a three-dimensional model by using BIM Technology is conducive to the construction personnel to accurately predict the possible problems. Find the potential safety and quality problems in advance, and take more effective strategies for reasonable prevention and control, such as changing the design scheme in time to eliminate the potential safety hazards in the embryonic stage, so as to significantly improve the safety management level of construction projects.

Finally, the characteristics of coordination. Construction enterprises can use BIM technology to build as perfect a database as possible. In addition to the design data, the database also contains the data of various projects and construction links, so the database built with the help of BIM Technology is relatively large. In this way, it can help managers understand the project information in detail and reasonably allocate various construction engineering resources. By using this technology, the relationship between various departments can be well coordinated, and BIM technology database can help staff solve differences in production management in time, and promote the coordination and cooperation of various departments, so as to achieve the expected effect of construction engineering safety management.

2 Significance of BIM Technology Application in construction engineering safety management

2.1 Beneficial to optimize the safety management mode

In the safety management of construction projects, the traditional management mode has been unable to adapt to the current more and more complex construction scenes, so the application of BIM Technology to the safety management of construction projects can effectively improve the safety level of construction projects and the quality of safety management. In the actual management, construction personnel can apply BIM Technology to integrate various information of construction projects, so as to organically combine the construction drawings with the construction model, shorten the review and correction time, and promote the safety management work to be carried out more efficiently.

2.2 Beneficial to improve the accuracy of safety management

The application of BIM Technology in the safety management of construction projects can improve the accuracy of safety cost analysis, which can automatically analyze multi-dimensional construction data information. In the specific implementation process, the construction personnel use BIM Technology to build a construction model that meets the needs of safety management, and accurately analyze potential risk problems in safety management, so as to avoid restricting the construction progress due to inaccurate safety risk analysis. The information of BIM database can be updated independently with the change of building structure, which enables the construction personnel to obtain the latest data of safety management in time, and quickly calculate the potential safety analysis, so as to ensure the safety management accuracy of construction projects to be significantly improved.

2.3 beneficial to improve the economic benefits of construction projects

The application of BIM Technology in the safety management of construction projects can reasonably integrate the relevant data and information of construction projects, including labor, materials, machines and tools. While improving the safety management efficiency of construction projects, the consumption of relevant resources will be accurately controlled, and some losses will be significantly reduced, so that the applicable efficiency of machines and tools will be improved, So as to maximize the utilization rate of resources, and then significantly improve the economic benefits of construction projects. Therefore, the application of BIM Technology in the safety management of construction projects can master the information of project cost more accurately, and can greatly improve the economic benefits.

3 Application strategy of BIM Technology in construction engineering safety management

3.1 Application of BIM Technology in project preparation

In the preparation stage of the project, BIM Technology can be used to analyze and evaluate the project, arrange the production resources of materials and construction machines and tools, so as to make the project controllable, orderly and stable, and make each stage of the project constitute an organic and unified whole. This is reflected in the following aspects:

1. In the material demand analysis stage, after a proposed building has a standardized building information model, in order to obtain accurate material demand, after calculating the physical volume of the project, the model of BIM modeling software can be imported into the traditional engineering measurement software for calculation, or the plug-in of BIM software can be directly used for calculation, So as to ensure the accuracy of the demand information of the means of production, to arrange the subsequent production to ensure that the production is safe and orderly. .

2. In the stage of site layout design, multi-dimensional collaborative design of site layout can be carried out, and the planning opinions, design opinions and facility requirements put forward by different units and different professional departments can be integrated. On this basis, the detailed design of various details can be carried out, so that the whole project department can show their needs on the same model platform. In addition, a building site model can be multi-purpose, and the site layout of different disciplines can be established and modified on the same model, which can calculate the reserved space between different disciplines, including component space and operation space, to ensure the enforceability of site layout. These operations can make the construction site safer and various safety factors more controllable,

3. In the preparation stage of construction organization design, using BIM to design the construction organization scheme can better find and verify the problems in the construction organization in the preparation process, especially when the construction organization scheme is more abstract and requires more resources to be allocated, its advantages are very obvious. For example, a project needs to carry out mass concrete pouring of the base plate, and the whole pouring process takes more than 50 hours. The available production resources include 5 mixing stations and 36 transport vehicles. How to arrange the route and transport capacity can be calculated, which effectively reduces the risk factors in the process of mass concrete pouring and improves the level of safety management. In the construction of a steel structure, the lifting and removal scheme of large components is the key and difficult point of the project. Considering the transportation and lifting weight constraints, the complex steel structure nodes, such as the 100 ton giant column base and dozens of tons of giant column nodes in the project, are split and refined, which can determine the resource allocation and help the construction team coordinate the key points, Reducing idling can also determine the hazard sources and avoid potential safety hazards.

3.2 Application of BIM technology in prior quality management

In the pre event quality management, the application of BIM Technology can build a highly accurate 3D model, through which the building information can be intuitively mastered. At the present time of the formal launch of the project, the potential safety problems can be found, which can improve the safety level of the construction project. Therefore, the construction personnel need to complete the construction of 3D model within the specified time, and constantly revise the model to ensure that the model is consistent with the construction site. The traditional technology is usually presented in the form of 2D electronic drawings and tables, which requires the construction personnel to have high professional quality to accurately understand the 2D electronic drawings, while BIM technology can make the drawings presented in 3D building models, which is relatively intuitive, not only ensuring that the construction personnel can accurately understand them, but also timely grasp the safety management process, In order to improve the level of safety management. Collision check is one of the most intuitive and easily realized value points of BIM technology Application. Through comprehensive “three-dimensional review”, a large number of hidden logical errors in the design are found to improve the safety of subsequent construction. For example, the construction personnel rely on the computer to use BIM technology to detect each collision point, and can find the collision point in the 3D building model and generate the corresponding report, laying a solid foundation for the subsequent safety management work. Specifically, when using BIM Technology to detect the collision points of a project, a total of 564 collision points were detected, of which 8 were serious, which would bring safety risks to the construction project. Before the implementation of the project, BIM technology is applied to timely detect the rationality of size standards and drawings, accurately detect potential collision problems and solve them, so as to improve the quality of safety management of construction projects.

3.3 Application of BIM technology in quality management in the matter

Nowadays, BIM technology is widely used in quality management and safety management of construction projects. Various distinctive BIM software has rich functions of simulation construction and collision inspection, which can assist the orderly development of safety management. Due to the large number of complex nodes in construction projects, it is difficult to comprehensively and accurately present each complex node by two-dimensional drawings alone, which affects the safety of construction projects. If the construction personnel present the drawings in three-dimensional visual form with the help of BIM 5D technology, it can not only accurately present the problems of each node, reduce the errors, omissions, collisions, defects and other phenomena of the traditional 2D mode, but also demonstrate the construction process in a dynamic simulation way, providing data support for the construction personnel to carry out safety management. Specifically to the application, Revit Software can perform collision check on the BIM model established by collaborative design, and its software comes with collision check function can find hard collisions and automatically generate collision reports. The collision points can

be accurately found through the “display” function, and then modified directly in the model. In the operation interface of Revit, we can select “wall” and “duct” for collision inspection, and we can also select other components with collision risk to carry out collision inspection. Through continuous analysis and comparison, we can improve the perfection of the building model and the accuracy of safety management. Therefore, in the safety management work, the construction personnel should be able to use the functions and characteristics of BIM software to detect various potential problems in time and formulate targeted solutions in time, which can ensure the orderly development of the safety management of construction projects, effectively improve the effectiveness of safety management, and ultimately improve the construction efficiency and quality, and shorten the construction period.

3.4 Application of BIM technology in post-event quality management

In modern architectural engineering, the role of engineering information is huge. In the case of scattered distribution of architectural information, how to effectively integrate and analyze data determines the value of information and its development and utilization, and the utilization of information value will have an impact on design decisions. In this regard, in terms of information processing tools, managers can analyze the project quality information from the dimensions of space, time and cost, comprehensively reveal the existing or possible quality problems in the project construction, find the influencing factors of the problems according to the analysis of the problem information, and put forward reasonable and feasible solutions. The summary of historical engineering information can also generate engineering quality control methods or patterns, which will become more and more mature when combined with more historical information. With the support of BIM technology, engineering information can be analyzed automatically in all directions, including commencement reports, quality acceptance records, submission documents, material review documents, design change documents, etc., after when there will be targeted quality problem analysis solutions, forming empirical information, providing reference for future quality control. BIM technology supports the electronic version of technical documents, quality inspection reports and other documents, which can be directly used as the audit basis, saving the time of searching, retrieving and browsing physical documents.

In short, in the safety management of construction projects, BIM technology, with its advantages of visualization and coordination, can provide decision-making basis for each link of the safety management of construction projects in the four links of project preparation, pre-event quality management, in-process quality management and post-event quality management, and effectively avoid the impact of various adverse factors on the safety of construction projects, So as to formulate a more scientific safety management scheme, and promote the efficiency and quality of construction project safety management to be significantly improved.

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