Research on Modern High-Rise Wind Resistant Design and Construction Management Based on Bim Technology

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Abstract: under the Premise of Supply side Reform, the Comprehensive National Strength and Scientific and Technological Level of the Country Are Gradually Improved. in the Process of High-Rise Building Construction, Modern Science and Technology Can Effectively Promote the Development of the Construction Industry. Bim Technology is a Modern High-Tech Technology. the Application of Bim Technology is the Focus of the Whole Process of This Building. It Can Solve the Related Problems in the Construction Process and Avoid the Construction Risks as Much as Possible. This Paper Will Focus on the Characteristics of Bim Technology in the Construction of Modern Buildings, Analyze the Collision Inspection and Drawing Optimization of Bim Technology Application, Explore the Economic Value Brought by Intelligent Technology, and Finally Provide a Modern Foundation for the Construction of High-Rise Buildings.

1. Introduction

At Present, with the Advancement of Science and Technology, the Construction Volume of the Construction Industry is Gradually Increasing, the Construction Structure of the Project is More and More Complex, and the Application of Modern Technology is More and More Extensive. in the Construction Process of High-Rise Residential Buildings, the Design of Pipelines and the Installation Design of Equipment Are All in a Systematic Way. Due to the Complexity of Construction Project Design, More Design Drawings Have Been Added, But These Architectural Drawings Are Only Two-Dimensional Charts, Which Can Not Be Three-Dimensional in the Performance of Construction Projects, So They Can Not Cope with the Later Construction of Current Construction Projects. Therefore, We Need to Introduce a New Technology Bim. Based on the Implementation of This Technology Model Can Effectively Promote the Normal Operation of Construction Projects, Using Three-Dimensional Drawing Design, to Avoid the Disadvantages of Two-Dimensional Drawings, and Then Optimize the Construction Design, Improve the Overall Efficiency of Construction Projects[1].

2. Summarize the Application Characteristics and Advantages of Bim Technology in Intelligent Building

2.1 Analysis of Application Characteristics of Bim Technology in Intelligent Building

In the structural design of residential buildings, BIM Technology can effectively guarantee the whole process of project construction. For the engineering designer, if the technical designer transforms the two-dimensional design drawings into three-dimensional design drawings as the output, the construction unit can also see the design concept of the designer. So as to ensure that all problems in the construction can be corrected in the construction design stage, and finally ensure the normal progress of the construction project[2]. In the design of engineering construction projects, through this technology, we can complete the simulation work of three-dimensional building model in various environments, such as lighting, temperature and humidity, energy

consumption, etc., and then design reasonable construction drawings to ensure the cost of the construction party. Through the use of BIM Technology can effectively control the design cost of the project in the construction process, and plan out the best design scheme.

2.2 Research on the Application Advantages of Bim Technology in Intelligent Building

With the help of BIM Technology, we can fully understand the construction steps and construction scheme design [3], and then take corresponding measures to model the possible construction problems, and finally get the optimization scheme of the construction project. In addition, with the help of the three-dimensional view of the building, the visualization degree of the construction can be ensured, and the process of the construction project can be ensured; through BIM Technology, the information sharing of each construction project can be successfully realized, so as to improve the information communication rate, so that the whole construction team can realize the understanding of the whole project, and promote the construction progress of the construction unit; with the help of the information model design of the building model, the In order to ensure the high efficiency of the construction project in the later stage[4], we should solve the problems in advance. Because BIM Technology has the ability of simulation in advance, so we can carry out the simulation work in advance before the construction, and finally promote the information interaction of all parties in the construction.As shown in Figure 1 [5].
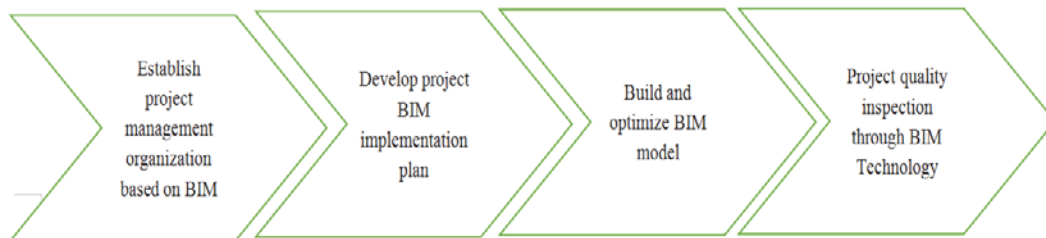

Fig.1 Bim Technology Implementation Process

3. Research on the Application Value of Bim Technology in the Construction of High-Rise Residential Buildings

3.1 Reasonable Use of Bim Design Model to Reduce Design Error

Building designers can use BIM Technology to design building information model and strengthen the reasonable design of residential building model. By inputting all kinds of data in the construction project into the information platform, this technology can be used to build the building model. In addition[6], BIM Technology also has the function of collision detection of construction equipment. Through the evaluation of collision points of building nodes, it can accurately analyze whether the prefabricated structure design can withstand the impact of various strengths. So as to make a reasonable design for the prefabricated components in advance, enhance the communication and cooperation of each construction unit, reduce the error in the construction process, complete the construction project, save the construction cost, and ensure the reasonable use of construction resources.

3.2 Improve the Means of Collision Detection and Eliminate the Problems in the Construction Project

In the process of building construction, using intelligent technology design mode, the main problem is design collision detection. Through the reasonable implementation of intelligent BIM Technology, the safety of construction can be guaranteed. Find out the risks in the construction project in time and make collision detection to avoid the unreasonable design of the construction project. In the pipeline design and inspection, the construction personnel combine with various departments to contact each other and improve the basic requirements of construction design. The main design process is based on the principle of whether the pressure pipe is available, whether the

small pipe gives way to the large pipe, whether the construction is complex and so on, and then make specific analysis according to the characteristics of the pipe itself. Through practical application, the pipeline design optimization is adopted to solve the problems of pipeline overlapping and crossing in construction. The application of intelligent BIM Technology can show the three-dimensional model of the building project, find all the problems in the residential design in time, and improve the construction quality of the project through reasonable optimization design .

3.3 Improve the Design Optimization of Drawings and Promote the Economic Benefits of Construction Buildings

In the design of high-rise residential buildings, using intelligent BIM Technology, design models can be made before the construction of construction projects, and the design models and engineering construction design drawings can be mutually studied to further improve the construction design scheme. In the design of construction drawings, the construction model of BIM Technology needs to be simulated. It is necessary to avoid the collision in the project engineering design, so as to reduce the complexity and construction difficulty of the construction project and improve the safety of the construction project. Using intelligent BIM Technology can effectively discover construction problems in advance, and make corresponding solutions, to provide reasonable guidance for the follow-up engineering design, to prevent the follow-up construction rework and waste of resources. Intelligent BIM Technology is used to detect the collision between beams, load-bearing walls and pipes in high-rise residential buildings, and summarize the specific detection data. According to the corresponding data[7], construction technicians can make the optimization of drawings before construction, so as to deal with the following problems such as unreasonable design. The specific optimization measures of building model, applied to high-rise building construction, greatly shorten the construction cycle, improve the rational use of resources, and ultimately achieve the economic benefits of building construction.

4. Application Significance of Bim Technology in Architectural Design

4.1 Breaking Technical Limitations

Building information model with BIM Technology, with the continuous development of this technology, people pay more and more attention to the information of the construction industry, for example, using BIM Technology to render the animation effect in the architectural design, so as to bring people real experience and experience. The application of BIM Technology in architectural design mainly hopes that it can transmit and apply information in architectural design. With the continuous update and development of current design software, BIM Technology has been promoted in the continuous application of architectural design. Therefore, the application of BIM Technology in architectural design has broken the original technical deadlock.

4.2 Create New Design Elements

From the perspective of the development of the construction industry, with the current macroeconomic development speed slowing down, the construction design industry will also usher in more fierce competition. In order to better cope with this market competition situation, construction enterprises must change the original architectural design, combine architectural design with information technology, promote the coordinated development of architectural design, construction, management and capital, so as to better cope with the current competition situation. The extensive application of BIM Technology in architectural design provides a reasonable working platform for people. The three-dimensional model established by this platform not only provides new project understanding for each specialty, but also avoids many professional incongruity problems in architectural design. By establishing BIM database and 5D associated database, the calculation of engineering quantity can be significantly improved The calculation accuracy and efficiency can achieve the best budget accuracy; the introduction of time concept can provide more accurate decision-making basis for construction simulation, investment return, project cycle

management and operation[8].

4.3 Change the Original Design Method

Using BIM Technology in architectural design can change the original architectural design method and carry out parametric design in architectural design. BIM Technology is mainly based on information, technology and practice, so it can be used as a new design method. With the application of BIM Technology, the architectural design has changed accordingly. At present, the application of BIM Technology in China is mainly large-scale public buildings. With the gradual reduction of the number of such buildings, architectural design will be the main direction of BIM Technology Application.

5. Environmental Analysis and Design

Light environment: use BIM building model to collect sunshine information, use three-dimensional simulation technology to scientifically show the building shading relationship, and then present the building sunshine visual pattern, so as to reasonably optimize the shading design in combination with the actual standards during the design period, so as to determine the best shading mode, select the best components, and achieve the best shading effect. In this stage, through the rational application of BIM Technology, we can collect the information of sunshine and surrounding environment in detail, analyze the lighting effect of each room carefully, and input the information of different lighting devices into the three-dimensional information model combined with the actual lighting design. By using the model to simulate the reasonable layout, we can achieve the best light environment effect, from determining the best room window size and location[9].

Wind environment: use BIM Technology to collect and analyze the air flow environment around the building, and then carry out corresponding ventilation simulation. With the help of simulation experiments, you can find the wind speed and wind direction and the actual situation of air pollution. With the help of the collected information data, carry out the corresponding functional design, and finally make rational use of the wind environment in combination with human comfort.

Indoor environment: during the analysis of indoor environment, the indoor noise shall be measured. During the analysis of indoor noise, the noise value shall be determined first, and the noise value shall be judged reasonably by BIM Technology. If the corresponding causing standard is reached, it is noise. During the determination of outdoor noise, the three-dimensional visual model can also be used, and the corresponding model measurement can be added in the analysis software, while the phase is opposite Accurate analysis of relevant contents.

Thermal environment: green building design mainly follows the principle of people-oriented, and carries out corresponding architectural design under the condition of human comfort, so as to reasonably control the indoor environment and thermal environment. BIM data model can be used to reasonably analyze the indoor heat, fully show the indoor temperature and humidity, and use the relevant data to calculate the thermal environment, and finally get the environmental data suitable for people to live, so that the design results are consistent with the residential comfort.

Acoustic environment. BIM Technology can be used to measure the information and environment of the sound source, and analyze the relevant data with the help of visual simulation, such as the correlation of the sound lines, the analysis of the reverberation time, etc. through continuous optimization of the indoor sound field design, the indoor sound field and sound wave can be changed to improve the indoor sound source environment. Moreover, BIM Technology can also simulate the surrounding environment, and take corresponding measures to reduce the corresponding noise interference through reasonable arrangement of design layout.

6. Conclusion

In conclusion, due to the high complexity of high-rise residential construction structure with pipes, beams and buildings, the intelligent BIM design mode can shorten the whole process of

construction, further reduce the cost of construction projects, and ensure the safety and stability of construction. In addition, improve the optimization of architectural drawing design structure, reduce the building collision rate, and promote the value of modern intelligent technology.

References

[1] Maria, Angeliki, Zanni., Robby, Soetanto., Kirti, Ruikar. (2017). Towards a BIM-enabled sustainable building design process: roles, responsibilities, and requirements. Architectural Engineering & Design Management, vol. 13, no. 2, pp. 101-129.

[2] Grit, Ngowtanasawan. (2017). A Causal Model of BIM Adoption in the Thai Architectural and Engineering Design Industry. Procedia Engineering, no. 180, pp. 793-803.

[3] Behnam, Atazadeh., Mohsen, Kalantari., Abbas, Rajabifard. (2017). Building Information Modelling for High-rise Land Administration. Transactions in Gis, vol. 21, no. 1, pp. 91-113.

[4] Arora, N., Dar, MI., Hinderhofer, A. (2017). Perovskite solar cells with CuSCN hole extraction layers yield stabilized efficiencies greater than 20. Science, vol. 358, no. 6364, pp. 768.

[5] Perfetti, C. Polari, F. Fassi. (2017). Fisheye photogrammetry: tests and methodologies for the survey of narrow spaces. Isprs - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, pp. 573-580.

[6] Alexander, W., Hird, J., Paul, Secrist., Ammar, Adam. (2017). Abstract DDT01-02: AZD5991: A potent and selective macrocyclic inhibitor of Mcl-1 for treatment of hematologic cancers. Cancer Research, vol. 77(13 Supplement), pp. DDT01-02-DDT01-02.

[7] Algan, Tezel., Zeeshan, Aziz. (2017). Visual management in highways construction and maintenance in England. Engineering Construction & Architectural Management, vol. 24, no. 3, pp. 486-513.

[8] Miller, G., Sharma, S., Donald, C., et al. (2017). Developing a Building Information Modelling Educational Framework for the Tertiary Sector in New Zealand. no. 409, pp. 606-618.

[9] Feng, Zhang., Yunfei, Liu., Fulong, Yuan. (2017). Efficient Production of the Liquid Fuel 2,5-Dimethylfuran from 5-Hydroxymethylfurfural in the Absence of Acid Additive over Bimetallic PdAu Supported on Graphitized Carbon. Energy & Fuels, vol. 31, no. 6.