

Exploring the Application of BIM Technology in the Design of Building Structures

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Abstract: BIM as a new technology processing process, and at the same time is the main substance of the information age, apply it to the construction engineering structure design industry, can by virtue of the functional characteristics, greatly improve the efficiency and effect of structural design. According to the BIM technology building structural design to build three-dimensional solid model, can effectively present the structural problems of building construction, is conducive to the designer can better carry out the next step, and at the same time reduces the shortcomings of the manual design program and the relatively high amount of tasks, in order to promote the trend of development of the construction engineering industry is of great significance.

Keywords: Construction engineering; Structural design; BIM technology; Application analysis

Introduction

BIM technology can clearly show the building structure in the form of data visualization, which is conducive to the analysis of statistical data by the designers. In addition, BIM technology can also effectively improve the efficiency of information exchange, which is conducive to the early discovery and removal of potential safety hazards in the construction of the main structure by the designers, thus improving the construction quality and construction efficiency. The application of BIM 3D simulation technology in the process of planning and designing the building structure by the technicians of the building structure related projects can immediately improve the efficiency and accuracy of the planning and designing process of the building structure,

therefore, the architectural designers should strengthen the exploration and application of BIM technology to ensure the reasonableness of the overall design of the construction project.

1 BIM Technology Overview

BIM technology is a brand-new technology under the environment of social and economic development at the present stage, which involves a lot of technical specific content, including basic level knowledge and skills and also can directly show the specific situation of the period of application. BIM technology is widely used in the construction industry at the present stage, and the use of BIM technology can effectively complete the production of 3D models, and can also realize independent innovation of traditional technologies and methods on the basis of original design theories. On



the basis of the original design theory, it can realize independent innovation on the traditional technology and method, compared with the traditional technology, this technology has stronger constructive characteristics in the use, and can realize the sensitive transformation of different technology and design principle. The truly targeted form of the project information for regular inspection and research, can realize the data and information exchange and adjustment, so that the user can better control the progress of the entire project ^[1]. At the same time can also be the completion of the project to visualize the problem, so that managers at any time can grasp the project's most basic progress and specific construction status, problems can be adjusted directly to a variety of issues.

2 Construction Engineering Structural Design Status

At this stage, the domestic real estate enterprise development trend is very rapid, many building construction capital construction began to high-rise residential and ultra-high-rise aspects of development. In order to ensure the overall structural stability and safety of multi-storey buildings, in order to carry out the specific structural design of buildings, we must make reasonable use of the construction design optimization methods and approaches, which can realize the shared development of construction design and cost control, and minimize the cost of capital investment under the premise of ensuring the stability of the construction design. Relevant research studies have shown that in recent years in China's housing construction structural design of design optimization methods, resulting in the cost of capital investment can be reduced by 15% or more, which is extremely beneficial to the company's economic gains ^[2]. Although the application of design optimization methods can achieve cost reduction, but in the specific application of the link but suffered all aspects of the conditions of the limitations, resulting in the design of the application of the difficulty is relatively large, for example, many companies in the specific development of housing construction and its design, in order to be able to reasonably reduce the construction cycle time, blindly follow the trend of attaching great importance to the project progress management methods, in the specific structure design, even if it is to see the non-compliance, unreasonable

problems, are not used. Unreasonable problems, do not use the relevant measures to dispose of, in this case again construction, not only will cause major product quality problems, and also very easy to bury the safety risk.

3 BIM Technology Features

3.1 Simulation

Designers can use BIM technology to establish a three-dimensional model of the construction project, to carry out preparatory processing of various structures, to carry out analysis of various structural enterprise statistics, to carry out simulation of the construction of the key parts of the simulation, to check the deficiencies existing in the construction stage, and then improve the actual effect of construction.

3.2 Data Visualization

Generally speaking, in the product development process of common building structure, a large number of structural design solutions all adopt 2D plane software to show the corresponding status of the main plan of housing and building structure, but the specific contents of some special location components and specific spatial coordinates can not be obtained in the 2D plane drawings to reflect the relative clarity. Through the practical application of BIM technology, the architectural engineering design staff can form a 3D three-dimensional structure of the mathematical analysis model, this solid model can be the main parameters and information related to the structural design process of the project building efficiently fused together in one place, through the spatial field of an embodiment of the structure of the contents of the implementation of a better performance ^[3]. The use of BIM technology can ensure that the overall design of the project building is more clear and visualized, laying the foundation for the whole process of construction in the later stage, which can greatly improve the quality and high efficiency of the construction process.

3.3 Transmissibility

BIM technology has the role of information sharing. The use of BIM technology in the structural design of construction projects can solve the problem of information sharing difficulties, which is beneficial to the construction of multiple parties to carry out collaborative management. The use of BIM technology

in the structural design of construction projects can prevent the problem of information sharing difficulty in traditional design by adopting the information management method, and correctly guide multiple parties to carry out collaborative management. Because BIM technology can provide the role of information sharing ^[4], it is conducive to the structural design program to make adjustments to all kinds of major parameters, and improve the high efficiency of the structural design of engineering buildings.

3.4 Flexibility

Compared with the traditional CAD technology, BIM technology can show the process of building 3D models of construction projects in a dynamic way, which is conducive to the designers to carry out regular checks on the structural design optimization and improvement. At the same time, each department can also input data about the project into the BIM cell phone to improve the ability of harmony management.

4 Advantages of BIM Technology in Building Structural Design

4.1 Maintain the Building Structure Design Flexibility

The use of BIM technology in the process of building structure design can make the design process of building structure maintain good flexibility. In the process of building structure design in the past, because the work of building structure design involves many aspects, so the designers of various disciplines must carry out comprehensive exchanges and communication, which will easily cause the problem of information clutter in the process of data and information communication. Relying on BIM technology, the designers of various disciplines can carry out the architectural design work on the same software, thus reducing the formation of data and information communication problems, so that the structural design of buildings has better flexibility.

4.2 Information Integration

In recent years, with the continuous improvement of information technology standard, it has reasonably promoted the reform and innovation of building structure design technology in China, and consequently, it has also continuously revealed the shortcomings and problems in the traditional building

structure design method. In the process of carrying out building structure design, according to the use of BIM technology, it can give play to the advantages of the information integration of BIM technology, establish BIM entity model, and it can be used to model every single building structure. Reasonable integration of each building structure data information, and subsequently, the building structure design staff can share this kind of construction data information in the BIM solid model. Therefore, according to the use of BIM technology to carry out building structure design, with obvious data and information integration characteristics, coupled with the application of other technologies in the BIM physical model, such as computer technology, three-dimensional technology, and so on, so that you can effectively create a complete building structure database system, in which there are different kinds of data and information in the building structure database system, according to the flexible use and detailed analysis of such data and information, it is possible to clearly identify the structure of the building structure. According to the flexible use and detailed analysis of such data information, the main parameters and specifications of different building structure modules can be clarified, which is conducive to the improvement of the quality of building structure design.

5 Application of BIM Technology in Building Structure Design

5.1 Application of BIM Technology in the Design of Main Parameters of Building Structures

According to the solid model of building structure based on BIM technology, in fact, the solid model is a database system that contains all the design elements and information, and according to the use of cutting-edge intelligent information technology, it can effectively connect different types of parameter indexes in the solid model of the building structure, and it also has the role of fully automatic change and fully automatic correlation. In the design of the main parameters of the building structure, according to the use of BIM technology, the design staff use the information network resources contained in the database to establish the corresponding physical model of the building structure, in addition, in the design of the building structure, according to the adjustment

of the various types of main parameters, so that in the design of the building structure by using BIM technology, the information in the database system can be updated continuously. In the construction engineering structure design process, according to the use of BIM technology, it is possible to upload and export the design information in a safe, reliable and high-quality way, and it is possible to pair the data and information systematically, so as to effectively improve the design quality of the building structure.

5.2 The Use of Bim Technology in the Design of Engineering Drawings

The application of BIM technology is created by the three-dimensional construction engineering model, through this three-dimensional modeling technology can be for the construction project structure design statistical data to carry out a more reasonable interpretation of the validity of the subsequent changes in engineering statistical information has brought an important guarantee. For the design method of the project drawings chosen in the past, if a certain position in the project drawings changes, it is necessary to take into account the relevant requirements of the structural design and the overall characteristics of the building structure and other dimensions, and can only be changed later, but several times to carry out changes in the project design strategy will lead to an increase in the cost of construction, and part of the premise will also lead to the design of the departure from the relevant regulations on the design of the building structure. Structural design regulations. However, if the BIM technology is used, the design staff only need to upload the relevant main parameters to the corresponding system, it will be able to realize the efficient change of the project drawings for the change of the main parameters of the construction of the building construction has brought a convenient, save a lot of project construction cost investment, at the same time is not easy to cause delays in the progress of the construction of the project, for the smooth implementation of the project to protect the safety of the project.

5.3 Application in the Design of Building Materials

Columns, walls, indoor staircases and other locations are important links in the construction engineering design, the relevant designers need to scientifically

and reasonably design the overall structure of many precast components in the design of building structures. Designers in the design of precast concrete structure link, must further consider the role of the building requirements and the pipeline in the building, and at the same time must be different between the building structure of the contradiction between the system to prevent problems. Designers in the design of prefabricated assembly building structure link, must be different components of the structure and connection points for all-round consideration. Therefore, the designers in carrying out the construction material design link, according to the use of BIM technology, can effectively change the plane drawings, can early discover the problems of the building structural components design, and take the corresponding improvement and improvement program.

5.4 The Application of Three-dimensional Dynamic Modeling

The application of BIM technology upgrades the building structure design from two-dimensional design to three-dimensional design. The shortcomings of two-dimensional design are mainly manifested in the limitations of linear design, design staff in the process of two-dimensional linear design, usually can not get the relevant change data information in a timely manner, which is easy to cause the lack of information in the construction process in the middle and late. However, BIM technology can fundamentally solve this problem. Design staff can use BIM technology to build three-dimensional dynamic model, this entity model can be based on the construction project in the field to carry out automatic updating of information, and can be completed between different units of data sharing and information communication. In the current specific situation, BIM technology has a very big opportunity for development.

5.5 Collision Inspection

The purpose of collision checking on the building structure is to avoid the problems of repair and change due to collision in the later stage. In the specific collision checking, it is necessary to combine BIM technology to build specific 3D modeling, to carry out simulation of collision elements in the early design process, and the integration of this mode can visualize the three-dimensional type to see whether there exists

each other in the design of the construction of indoor space and its collision problems, and then take this as the basic to improve and improve, and finally clear up the collision problems that appeared in the early design. After doing the collision regular check to improve the design, the worker can directly use this design plan to carry out construction delivery and engineering simulation, so as to achieve the purpose of improving the quality level of the construction design project.

5.6 Bim Technology in the Design of Architectural Space Utilization

Before the construction project construction design, must do a good job of building space planning work, the establishment of the corresponding building construction address can be performed before the interpretation of the building space, but for the building space terrain to be analyzed and measured, in the establishment of a specific plan after the use of BIM technology, for the straight line slope, slope height of the main parameters of the analysis, to ensure that the project building design plan is more comprehensive. The use of GIS software to establish the corresponding entity model, collect a lot of architectural engineering construction main parameters, and then combing, analysis of steep slopes of the specific direction, which can be for the relevant personnel on the simulation of building construction projects to give a certain degree of convenience, to the back of the strategy of the design of the foundation, in the project building geomorphological survey work, must be for the implementation of the main project of the construction of the building construction plan design, and the BIM technology in this play a role in this. BIM technology plays a very important role in this, may be due to the use of BIM technology can be the main body of the project building inside and outside the indoor space according to the form of three-dimensional model to show, so that the design staff can also be based on the physical model of the main body of the project indoor space for reasonable distribution, design and construction of the project surroundings, and then realize the construction of the construction of all the relevant resources reasonable allocation.

Conclusion

In conclusion, the design process is the upstream and downstream links in the life cycle of the construction project, and the rationality of this stage can not only lay the foundation for the construction of the project later, but also ensure that the project is developed to achieve the expected rate of return in the market promotion. In China's building construction design, according to the use of BIM technology, not only can effectively ensure the quality of the design of construction projects, design precision, design coordination analysis, multi-dimensional view of the design of rationality, reasonableness, but also to ensure that the construction management methods, construction of departmental design, construction of the coordination of individual projects, sharing of information, and its construction safety, and through the development of BIM technology, and its construction simulation simulation emergency preparedness. And its construction of simulation simulation emergency plan and other initiatives, accurate narrative construction of a variety of security main parameters, enhance operational efficiency, save time and labor costs and raw material costs, and further improve the construction of construction projects of high efficiency.

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