

Application of Green Building Design under BIM Technology

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Abstract: In recent years, the problem of resources and environment has been increasing, both domestic and foreign countries are vigorously developing the cause of energy conservation and environmental protection, and all walks of life have responded positively to the call of the country and are developing in the direction of green, energy saving and environmental protection, and the construction industry is no exception. In this context, the number of green buildings in China is increasing. During the process of green building design, in order to improve the level of design and ensure the quality of design, BIM technology can be applied, this paper makes a related exposition and analysis.

1. Advantages of BIM Technology in Green Building Design

Nowadays, the construction quality of our country is constantly improving, and the quantity of green buildings is also increasing. With the support of national policy, the construction industry of our country begins to develop in the direction of green and large-scale. In order to fully meet the requirements of energy conservation and environmental protection, we should actively study new technologies and processes. BIM technology is a common technology in recent years. It is widely used in the construction industry and can improve the quality and level of architectural design. During the process of green building design, BIM technology can also be used to comprehensively analyze the energy saving effect of buildings, optimize various design contents, improve the level of energy saving and environmental protection of buildings, and lay a solid technical foundation for the development of green buildings.

Generally, in the traditional architectural drawing design, hand-drawn or CAD drawing is generally used, the drawing is mainly one-dimensional or two-dimensional, it is necessary to draw the plan, elevation, section and other detailed drawings into the drawings, the drawing content is not only very complex, but also abstract, the communication between designers and construction personnel is difficult, and then affect the construction efficiency. The building model contains a lot of information, the traditional drawings can only carry out the summary of information, can not be analyzed and judged, and it is not helpful to the construction decision.[1]. After using BIM technology, we can construct information model, and then understand the information data of the building more stereoscopic and comprehensive, so that the communication between various units and departments can be more smooth, thus improving the efficiency and quality of the construction. The concrete application advantages of this technology include the following aspects:

1.1. Visibility

BIM technology (such as figure 1) has the application effect of software such as 3 DMAX, which can not only construct the building effect map, but also create the building animation. The combination of the two can analyze and calculate the building structure more comprehensively and accurately, display the building structure map in detail, and generate the more stereoscopic drawing. For example, in the process of architectural design, if we want to change the location of doors and windows, if we adopt the traditional design method, we need to modify the face map, section map, plane map and so on one by one, and use the BIM technology, as long as we modify the associated data, it is simple and fast.

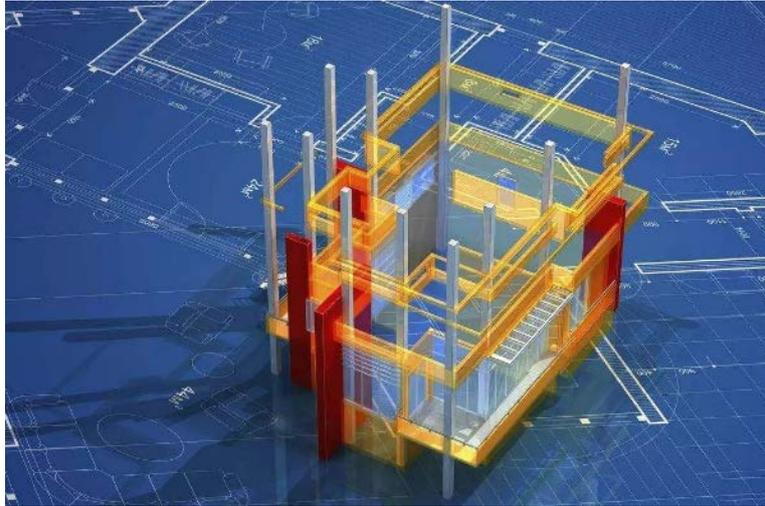


Figure 1 Application of BIM technology in architectural design

1.2. Simulations

During the process of architectural design BIM the technology can simulate each parameter and optimize the scheme on this basis. For example, simulating sunshine, ventilation, noise and other data, according to the simulation results to optimize and improve, so that the scheme is more scientific and perfect.

1.3. Coordination

The traditional design drawings of the information bearing and summary capacity is relatively weak, can not accurately analyze and judge the progress of construction, if there is a mistake, it needs to be completely modified, or even directly affect the progress or quality of the project. After the application of BIM technology, we can coordinate a number of information, summarize the information of construction, structure, electromechanical and so on in the model, grasp the problems that may appear in the construction, avoid the contradiction or collision between the cross construction, and greatly improve the coordination and perfection of the design.

1.4. Optimizable

BIM gold technology uses geometry, parameters, data and so on to optimize and perfect the project, which can not only build 3 D building model, but also combine time and cost to further build 5 D management mode (such as table 1), so that construction management is more dynamic[2]. In the virtual construction model, various schedules and reports can be generated, taking into account the space and environment, but also to meet the needs of green environmental protection, and to improve the overall quality and level of the design.

Table 1 The 5 D management model of BIM technology

Space	Data		Documentation
Big Data Writing Cloud Platform		Engineering Cloud Collaboration System	
Visual Operations and Maintenance Systems	BA/ Control System	Water supply	General contractor
ERP	CAM	Procurement	Designer
Video	Security	Electrical	Construction

2. Comparison Between BIM Technology and Traditional Technology

2.1. Sunshine

In the process of architectural design, sunshine is an essential design content, reasonable

sunshine distance can ensure indoor temperature and lighting. With the traditional design method, the distance of sunshine should be calculated according to the formula. $D=(H-H_1) \times \cot(\alpha) \times \cos(\beta)$. H 、 D 、 h 、 H_1 and the α are the height of the front row building, the distance between the flat bottom sunshine between the buildings, the angle of the solar height, the height of the low floor window sill of the rear row building, and the angle between the building wall and the sun, respectively. This formula is more complex, the calculation process is easy to make mistakes, the accuracy of the results is poor, and the efficiency of obtaining the results is low. If the BIM technology is applied, the calculation method can be simplified, so long as the model is imported into the corresponding software, the software can be used to calculate and analyze, and then the calculation results can be obtained more quickly and accurately (figure 2).



Figure 2 Application of BIM technology in sunshine distance calculation

2.2. Lighting

Indoor lighting is a content that must be considered in architectural design, especially in green construction, reasonable lighting design can reduce the consumption of electric energy. In the traditional design method, the window position is usually raised to extend the lighting time, or the total power of the lamp is pushed back according to the current value, and then the number of lamps needed is obtained. There are errors in this calculation method, and the actual effect may not be obvious. With the application of BIM technology, the lighting design and analysis can be carried out by using Ecotect software, and the reflection board is set up in the position of the window to reflect the sunlight to the indoor, and then to increase the illumination range of the indoor. The software can also simulate the lighting effect of lamps, and adjust according to the specific lighting effect can make the design more accurate.

2.3. Energy Conservation

The most important feature of green building is energy conservation and environmental protection, so we should especially emphasize energy saving design. In the traditional design scheme, the existing design cases are usually referred to, and then the data input is carried out according to the experience and professional knowledge of the technicians, and the software is used for analysis and calculation. This manual input method lacks accuracy and will waste a lot of time and labor costs, and the results can not be directly reflected in the model, which can not be used as an effective reference basis to help designers. With the application of BIM technology, the Ecotect software can be used to analyze the direction, structure and energy consumption of the building, and then understand the energy saving level of the building more intuitively, and design more effective energy saving scheme.

3. Application of BIM Technology in Green Building Design

3.1. Energy Conservation and Utilization

Green building is the main goal of building energy conservation and environmental protection, building energy use level is an important index to evaluate building quality, but also the main

direction of BIM technology development and application. During the process of green building design, the BIM model is constructed to analyze the intensity and range of outdoor solar radiation, and on this basis, the installation scheme of solar energy equipment is to maximize the utilization efficiency of solar energy, at the same time, the indoor lighting is fully analyzed, and the electric energy consumption is reduced by natural lighting. Combining BIM technology with architectural design and analysis software, it can improve the system and integrity of architecture in an all-round way, which is beneficial to the improvement of building quality.[3]. In terms of project investment, BIM technology can also be used to enhance the overall efficiency of construction projects through comprehensive analysis and evaluation, fully meet the requirements of energy conservation and environmental protection, and further improve the quality and level of green buildings.

3.2. Saving and Utilization of Materials

Nowadays, the requirements of our residents for public buildings are constantly improving. In order to meet all kinds of requirements, many engineering design schemes are lack of rationality, and even the situation of mechanical and electrical pipe network chaos and so on. Aiming at this kind of problem, we can use BIM technology to solve it, which can detect the design of pipe network, automatically query the position of "collision" and "contradiction" in engineering design, and mark the problem in detail, and show the distribution of pipe network by constructing 3D model to avoid the problems of error, leakage, collision and so on, so as to improve the application efficiency of materials. BIM technology can be used for complex, diverse architectural structure analysis, can be intuitive, specific display of designers' ideas. The 3D model can not only analyze the building structure, but also analyze the budget cost, economic type and so on, which is of great help to the improvement of the overall benefit of the construction project. In the process of evaluating green buildings, the use of this technology can be more accurate and detailed to evaluate the application of materials, not only to ensure the environmental protection of materials, but also to improve the efficiency of the use of materials.

3.3. Optimal Analysis of Indoor Environment

In the process of interior environment design, we should mainly analyze from the angle of illumination value, color development value, glare value and other parameters. Green buildings should play the role of natural light as far as possible, and actively adopt energy-saving lamps, which should not only ensure adequate indoor light, but also reduce the waste of energy. The specific scheme should be designed according to the construction drawings, product specifications, relevant specifications, reasonable selection of indoor lamps, to ensure that brightness, color temperature and so on are in line with the requirements of use and energy saving. At the case of direct sunlight, the indoor temperature will rise with it, and sometimes even lead to excessive temperature, so it is necessary to carry out sunshade design, to select the corresponding materials, to ensure the perspective of daylighting and ventilation, and to use BIM technology to simulate this effect.

4. Conclusion

Above all, BIM technology can be applied in the process of green building design. This technology not only has the application advantages of visualization, simulation, coordination and optimizability, but also can play a great role in lighting design, sunshine spacing calculation, energy saving design and so on, which is beneficial to the improvement of green building quality in China.

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