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Application of BIM technology in energy-saving design of green building

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Abstract: *Nowadays, the energy consumption of the building industry accounts for a large proportion of the total energy consumption, in order to achieve sustainable development, energy conservation, energy-saving concept of green buildings emerged. Green building energy-saving is from the beginning of the design to construction and then to the operation of the whole life cycle, the use of sustainable development concept of green building energy-saving technology, so that it becomes a land-saving, water-saving, material-saving, energy-saving, to provide people with a healthy, applicable and efficient use of space, and natural harmony and symbiosis of the building. In the Information Age today, it is inevitable to use computer to assist people to work efficiently, and BIM (building information model) technology is a kind of 3D information as a carrier to assist the architectural industry design, construction, operation of technical means.*

Keywords: *BIMtechnology; Greenbuildingdesign; Application*

1. Introduction

1.1. Research background

With the beginning of the industrial revolution, the non renewable energy that supports human development has gradually decreased, and the natural environment has also been seriously damaged with the rapid development of industrialization. The shortage of resources and global environmental problems have aroused people's concern. It is found that the global construction industry produces harmful substances, which is the main reason for climate change. Scientists believe that compared with the global temperature level in the pre industrial period, the global temperature rise must be controlled within 2C. If the global temperature rises by more than 2C, disasters will ensue: food production will decrease, the disappearance of the original glacier snow will endanger the city's drinking water, extreme abnormal climate change will be more intense, the rising sea level will inundate coastal areas, many species will also disappear, and human beings are also in danger. With the emergence of the concept of sustainability, the concept of green building energy conservation has also emerged. According to European research, 50% of all energy consumption is consumed by the construction industry. And the development of green building energy conservation, which is a harmonious symbiotic building with nature, is to solve the problem of large energy consumption in the construction industry.

In recent years, China has issued many relevant policies to promote the development of green building energy conservation, For example, the State Council recently issued the "13th Five Year Plan" Comprehensive Work Plan for Energy Conservation and Emission Reduction, which requires that "by 2020, the green building area in cities and towns will account for more than 50% of the new building area. This shows the potential for the development of green buildings in China. The energy conservation of green buildings is based on the full understanding of nature, respect for and compliance with nature. In order to reduce energy consumption and meet the requirements of using more natural light and natural ventilation, the shape of the building is likely to be different from the traditional square shape. In order to reduce wind load, most buildings are cylindrical. In order to use more natural light, most floors of the building may be uneven The uniqueness of appearance leads to the increase of difficulties in structural design and construction drawing. In the face of more and more huge building volumes and more and more diverse participation units in collaborative design, the existing technical means can no longer meet the market needs. In addition, green building energy conservation pays attention to the whole life cycle of the building, and information transmission fault will occur with traditional technology. The emergence of BIM brings dawn to solve the above problems. BIM is the second information revolution in the construction industry after the comprehensive promotion and

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application of CAD technology in the 1990s. As one of the most emerging technologies in the current construction industry, BIM has promoted the technical evolution of the construction industry from 2D CAD to 3D BIM. As a highly integrated collection of 3D information data, BIM can effectively solve the technical problems such as information transmission fault, massive duplication of modeling work, and poor coordination among disciplines in the process of traditional green building energy-saving design practice. To a large extent, it has met the needs in the design of green building energy-saving projects. Before that, China also attached great importance to the use of BIM technology in green building energy-saving[1].

1.2. Purpose and significance of research

Through the research on green building energy conservation, aiming at the problems of information transmission fault and repeated modeling analysis of performance simulation in green building energy conservation design, combined with the technical principle and functional characteristics of BIM, the BIM technology is organically combined with green buildings, combs the work process of green building energy conservation design based on BIM, and puts forward the application strategy of BIM technology in green building design. It plays a role in promoting the research on the combination of green building energy conservation and BIM in the theoretical sense, and plays a reference role in the practical work of the design institute and others in using BIM technology in green building energy conservation design[2].

1.3. Research status at home and abroad

1.3.1. Research status of BIM technology at home and abroad

In the 1960s, the emergence of computer graphics promoted the development of computer aided design. In the 1970s, Charles Eastman, the famous father of BIM, began his pioneering research on BIM. In 1974, Professor Eastman established the Building Description System (BDS) in the Outline of Building Description System (4) published by Professor Eastman to solve the problems of repeated drawing and inconsistent drawing in architectural design at that time. Later, in 1975, he published The use of computer in architectural design instead of drawing in building Iding design to further introduce BDS. In fact, his BDS is actually the dimension of BIM. Over the next 20 years, Professor Eastman has been committed to the research of building entity modeling, design cognition, etc., and published many influential papers during this period. In 1999, Professor Eastman published his first monograph Building Product Models: Computer Environment, Supporting Design and Construction "This book mainly introduces STEP standards and IFC standards, explains what are the supporting technologies and standards for modeling and modeling, and proposes to develop a new digital expression method for architectural design and construction, which is a landmark work in the history of BIM development.

From the 1980s to the 1990s, BIM technology moved from exploration to extensive application and vigorous development. The facility integration center (CIFE) established by Professor Paul of Stanford in 1988 is an important symbol of the BIM research and development process. In 1996, CIFE put forward the theory of 4D project management, including the time attribute into the building model. To realize informatization, visualization, integration and intelligence of construction management.

Although less than 1% of the projects in our country apply BIM technology, most of these projects are bulky and complex projects such as China Zun, water cube, Shanghai Center, etc. , they all adopted high-standard and high-level BIM technology, and obtained good application results. With the increasing awareness of BIM in the construction industry in recent years, the state has also issued relevant policies to support and promote 2011, the Ministry of Housing Development released the development program of construction industry informationization from 2011 to 2015, which puts forward the goal of “Accelerating the application of new technologies such as building information model (BIM) , network-based collaborative work, and promoting the construction of informationization standards” [3].

1.3.2. Research on green building energy efficiency at home and abroad

In the 1960s, people began to pay attention to the ecological environment because of the worldwide environmental pollution and imbalance of ecological balance. At this time, American architect Paul Solery first integrated the two disciplines of ecology and architecture and proposed a new concept of "ecological architecture". In 1976, the United Nations organized a national conference on "ecological environment human community" to link the ecological environment with human settlements. "With the

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proposal of the concept of" sustainable development "in the 1980s, most developed countries in the world began to explore the path of green building energy conservation research. In 1990, the world's first green building energy efficiency evaluation standard was issued by the United Kingdom. Then, in 1995, the United States USGBC issued the Energy and Environmental Design Pilot Plan (LEED). LEED is now the most widely recognized evaluation standard in the world, and it is also a model for countries to establish green building energy efficiency evaluation based on their own national conditions. After that, Canada, Japan, Australia, Germany and other countries also began to introduce national green building energy efficiency evaluation standards. Canada uses the Green Building Assessment Tool (GBT00L), Japan uses the Environmental Efficiency Comprehensive Assessment System (CASBEE), and Australia uses the GreenStar System. The release of these green building energy efficiency evaluation systems and policies has also promoted the rapid development of green building energy efficiency worldwide[4].

1.4. Research content

First of all, this paper mainly introduces the background and significance of the topic, domestic and foreign research status of BIM technology, domestic and foreign green building energy saving research status and research methods, research content and technical routes. Secondly, the related theory of BIM technology, green building energy-saving theory, green building energy-saving design theory. Then, according to the existing problems of green building energy-saving, combined with the advantages of BIM technology, the application of BIM technology in green building energy-saving design is analyzed. According to the research method, the energy-saving design stage of green building is divided into four stages: pre-design stage, scheme design stage, preliminary design stage and construction drawing design stage, the application of BIM technology in different design stages of green building energy-saving design is studied, and the theory and practice are combined with concrete cases. At last, the paper summarizes and looks forward to the future[5].

2. Research on BIM technolog

2.1. The concept of BIM

BIM technology is a 3D digital technology applied in the whole life cycle of a facility. It creates and collects all relevant information of the facility in a common data format that runs through the whole life cycle, and establish information coordination information model, as the basis of project decision-making and information-sharing resources.

2.2. BIM technology features

(1)Visualization of operations

Visualization is based on BIM technology in the three-dimensional information environment, building design, pipeline collision inspection and simulation of construction. In the traditional CAD technology, the design institute can only hand in 2D drawings. In order to make the owners and users who can not understand the architectural drawings to see clearly, we need to commission animation company rendering renderings, or do some physical models. Although renderings and models provide visual effects, this visualization is limited to display effects, but can not carry out simulation of energy consumption, collision inspection, construction simulation. And now the scale of the building is larger and larger, the shape is more and more strange, Space Division is more and more complex, people on the building function requirements are higher and higher. Faced with these problems, without BIM visualization technology, it is difficult to rely on the imagination and memory of designers. Many issues are not always communicated clearly on the project team, making it more difficult to analyze in depth to find a reasonable solution[6].

(2)Information completeness

Bim is a digital representation of the physical and functional characteristics of a facility, which contains all the information of the facility, including the description of the 3D information and the topological relationship of the facility, as well as the complete engineering information. Such as: Structure type, object name, building materials, engineering performance design and other information; construction progress, construction cost, construction quality and people, materials, machines and other construction information; Maintenance information such as engineering safety performance, material

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durability, engineering logic relationship between objects, etc.

(3)Coordination of information

Coordination is two-fold: one is to create real-time correlations between the data, and any changes made to the data in the database are immediately reflected in other correlations; The other is to realize the association display and intelligent interaction between the component entities. This technical feature is important. After the establishment of information-based building model design results, the model of the flat, vertical, cutaway two-dimensional drawings and diagrams of doors and windows can be directly generated based on the model. Moreover, all the drawings and diagrams derived from the same digital model are interrelated, thus avoiding the problems of drawing with two-dimensional drawing software. If you make any changes to the model on any one of the plans, elevations, or sections, it will be seen as a change to the database model, and any changes to the other views will be immediately shown, the correlation changes in real time. In this way, the integrity and robustness of BIM model can be maintained, the work efficiency of items can be greatly improved in actual production, the difference between different views can be avoided, and the project quality of items can be guaranteed [7].

2.3. BIM technology related standards

The core idea of BIM technology is to share information model and improve work efficiency based on 3D building information model. In order to facilitate the sharing of information models by technology and management, we need to unify information standards. BIM standards can be divided into three categories: classification and coding standards, data model standards, and process standards.

(1)Classification and coding standards

It is a standard to specify how to classify building information. A large number of different types of information will be generated in the whole life cycle of buildings. In order to improve work efficiency, information needs to be classified. The classification and coding of information is an indispensable basic technology for classification and coding standards. The current classification and coding standards adopted in China are JG/T151-2003 Classification and Coding of Building Products and GB/50500-2014 Code for Valuation of Construction Projects with Bill of Quantities for cost budgeting.

(2)Data model standards

IFC standard, GBXML standard and CIS/2 standard are widely used in the world at present, our country adopts the platform part of IFC standard as the standard of data model.

IFC standard is an international standard for open construction product data expression and exchange, in which IFC stands for Industry Foundation classes. The IFC standard can now be applied throughout the entire life cycle of a project, and is now supported by BIM applications for construction projects ranging from survey, design, construction to operations.

GBXML is short for the Green Building XML. The purpose of the GBXML standard is to facilitate the transfer of architectural information between data models of different CAD systems based on private data formats, in particular, it facilitates the exchange of information between data models for building design and applications for building performance analysis and their corresponding private data models.

(3) Process standards

Bim is a model standard produced by different disciplines in different stages of BIM information transmission in construction projects. The process standard mainly includes IDM standard, MVD standard and IFD standard.

3. The research of green building energy-saving theory

3.1. The concept of energy efficiency in green buildings

At present, the concept of "green building", which is widely recognized by the professional academic field, the government and the public in China, is defined in the Energy Efficiency Evaluation Standard for Green Buildings issued by the Ministry of Construction in 2006, That is, "in the life cycle of a building, a building that can save resources (energy conservation, land conservation, water

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conservation, material conservation), protect the environment and reduce pollution to the maximum extent, provide people with a healthy, applicable and efficient use space, and live in harmony with nature."

Characteristics of green building energy efficiency compared with traditional buildings:

(1)Compared with traditional buildings, green buildings use advanced green technologies to greatly reduce energy consumption.

(2)Green building energy conservation focuses on the ecosystem around the building project, making full use of natural resources, lighting, wind direction, etc, so there is no clear building rules and models. Its open layout is quite different from the closed traditional architectural layout.

(3)Energy conservation of green buildings should be based on local conditions and local materials. Pursue sustainable architectural design that can meet people's needs without affecting the healthy development of natural systems, so as to save resources and protect the environment.

3.2. Green building energy efficiency design principles

The principles of green building energy-saving design are summarized as the principles of region, nature, high efficiency, energy-saving, health and economy.

(1)The principle of regionalism

The energy-saving design of green buildings should fully understand the natural geographical elements, ecological environment, climate elements, human elements and other aspects related to the site. It also inspects and studies the local architectural design, absorbs the advantages of the local architectural design, and combines the relevant local green evaluation standards, design standards and technical guidelines to design green building energy conservation.

(2)The principle of naturalness

In the energy-saving design of green buildings, the original terrain, landform, water system and vegetation should be retained or used as much as possible to reduce the damage to the surrounding ecosystem, and the damaged ecological environment should be repaired or reconstructed. In the process of green building construction, if the ecosystem is damaged, some compensation technologies should be used to repair the ecosystem. And make full use of natural renewable energy, such as light energy, wind energy, geothermal energy.

3.3. Green building energy efficiency design objectives

At present, the general recognition of green building energy efficiency is that it is not a school of architectural art, and is not simply a methodology, but the relevant subjects (including owners, architects, governments, builders, experts, etc.) in the social, political, cultural, economic and other background factors, attempts to carry out the architectural expression of the harmonious development of nature and society. The concept goal is to reduce the environmental and ecological impact when green building energy-saving design, coordination to meet the economic needs and protect the ecological environment between the contradiction; To meet People's social, cultural and psychological needs combined with the environment, economy, social and other elements of the comprehensive goal. Evaluation target evaluation target is that in the process of building design, construction and operation, the relevant indexes of the building meet the requirements of the energy-saving evaluation system of the green building in the corresponding areas, and obtain the evaluation marks. This is the current green building energy efficiency design based on the goal[8].

4. Application of BIM technology in energy-saving design of green building

4.1. BIM technology in green building energy-saving design method research

With the release of relevant policies, such as the state council published the “13th five-year plan” comprehensive work plan on energy conservation and emission reduction, called for strengthening energy conservation, vigorously developing green building energy efficiency. Green building energy efficiency is developing rapidly in our country. In order to judge whether the building can reach the standard of green building energy efficiency, our country and local have issued the evaluation standard

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of Green Building Energy Efficiency. Because our country green building energy conservation compares with the foreign development is not mature, therefore in the present stage green design also has some problems [9].

4.1.1. Problems in energy efficient design of green buildings

(1) to the green building energy-saving design idea understanding is weak

At this stage of green building energy-saving design because the project design time is not sufficient. Lack of communication with the green building energy efficiency consulting team does not allow the green consulting team to really participate in every stage of the design, especially now many green building energy efficiency, in the early stage of the design or adopt the traditional design methods, there is no scientific and advantageous analysis on the natural factors that affect the energy-saving design of green buildings, such as the site climate, the site topography, the terrain, the wind environment, the sound environment, just according to the designer's own experience to carry out pre-design, which led to green building energy-saving design"Energy-saving"concept did not enter the project from the beginning, did not fundamentally resolve the conflict between technology and the building, and now the Green Assessment, and performance simulation is to wait until the design is completed in the process, and does not form a guiding role for the design[10].

(2)Lack of information on green building energy efficiency in the whole life cycle

The concept of green building energy-saving focuses on the whole life cycle, an excellent green building energy-saving project, not only in the design of the application of green design technology, it is also necessary to pass on the design information data of green building energy efficiency, so that the design information data can guide the construction and the operation and maintenance of the project in the future. At this stage, energy-saving projects for green buildings are becoming more and more complicated, it is difficult to extract effective green building energy-saving information from many two-dimensional drawings and save it to the operation stage of green building energy-saving. During the review of the green building energy-saving construction phase, it was found that many green building energy-saving design information could not be realized, and a small number of designs that could be realized were also due to the lack of awareness of data preservation among the personnel, and participate in the project professional multiplicity, data can not be unified delivery, leading to green building energy efficiency in the whole life of the lack of information [11].

4.1.2. Advantages of the application of 2BIM technology in energy-efficient design of green buildings

Aiming at the problems existing in the energy-saving design of green building, combining the characteristics of BIM technology, using BIM technology to solve the problems in the energy-saving design of green building and optimize the energy-saving design of green building.

(1)Collaborative design

Green Building Energy saving is a comprehensive design process that spans disciplines and stages. In the design process of green building energy saving projects, needs the owner, architect, green consultant, architect, HVAC engineer, water engineer, interior designer, landscape engineer and other professional participation and timely communication. In order to unify a green energy-saving design concept in the project, pay attention to the building's internal and external system relations, through the shared BIM model, at any time to track changes in the program, so that all professionals involved in the project always, and pay attention to the internal connection of various professional systems, such as the installation of new energy-saving windows, thermal insulation performance higher than conventional windows, in the summer with shading and ventilation functions, then need to contact the equipment professional, let the equipment engineer reduce the installation of air-conditioning and other equipment.

(2)Comparison of performance analysis schemes

Conventional performance analysis simulations for green building energy efficiency must be operated by professional technicians using the software and manually entering the relevant data, and when different performance analysis software is used, need to re-model for analysis, when the design needs to be modified, it will cause the original time-consuming data entry re-calibration, model re-modeling. A great deal of manpower and material resources are wasted in this way. This is also the reason why green building energy-saving performance simulation has become a kind of symbolic work at the stage of construction drawing design. This problem can be solved by using BIM technology,

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because during the design process, architects have stored a lot of BIM model design information, including geometric information, component properties, material properties and so on. So we don't need to re-model the BIM model, only need to convert the BIM model to the GXML format which is commonly used in the performance simulation analysis, then we can get the corresponding analysis result, this greatly reduces the time required for performance simulation analysis. Secondly, through the analysis and simulation of the site environment, climate, so that architects rational and scientific site design, proposed a harmonious coexistence with the surrounding environment of green projects[12].

4.1.3. Green building energy-saving design method based on BIM

Green building energy-saving design based on BIM platform, can refer to the traditional design process, the green building energy-saving design process standard, and make the green building energy-saving design concept into each design link, so that it can be in the design of practical operation of the working method and workflow. First of all, the establishment of green building energy-saving design team, because the green building energy-saving contains a wide range of professional, so should be in the building, structure, electrical, equipment and other professional team based on, add planning, economic, landscape, environmental green building consulting and other professionals. After the expansion of the green building energy-saving team, the BIM team will be integrated on this basis, and a special person will be appointed as the BIM manager, this requires the Green Building Energy Efficiency Project BIM manager should be BIM technology and the whole building green design, construction, operation of a comprehensive understanding of the people. He should lead the BIM modeling staff, BIM analysts, BIM consultants and green construction design team to compile the overall work content of the green construction project[13].

(1)to determine the objectives of the construction project, including the evaluation grade of the green building energy-saving project after completion, and to set up the BIM communication platform for participants to discuss the positioning of the research project, so as to unify and form a common design concept.

(2) work out the workflow, under the lead of the BIM manager, assign the actual responsible engineer to design the BIM model, and determine the sequence and relationship between the different BIM applications, make all team members aware of their own workflows and how they relate to other team workflows.

(3) to establish the requirements for the exchange of various information in the process of establishing the model, and to define the requirements for the exchange of information among the different participants, make the content, standards, and requirements of the information exchange very clear between each information creator and information recipient.

4.2. BIM technology in the green building energy-saving scheme design phase of the application of research

4.2.1. BIM application point in the early stage of green building energy efficiency design

In the stage of energy-saving design of green building, the designer should analyze the sunshine and ventilation in combination with the topography and landform of the site, and use passive design to design the shape and layout of the building reasonably. In fact, passive design and building layout planning is to deal with the relationship between Sunshine and ventilation, reasonable building shape design and building layout planning can achieve green building energy-saving, material-saving, land-saving, energy-efficient. The designers also need to carry out preliminary ecological simulation and energy consumption analysis of the conceptual plan, so that the designers can choose the best plan from the angle of environmental impact and green building energy conservation consulting team[14].

In recent years, many complex landmark buildings in our country are built according to the green building energy-saving standard, so the shape of these large-scale buildings is very complex, for the traditional two-dimensional design there is a lot of work. The use of BIM technology for the initial architectural volume and shape of the conceptual design, the design will be completed quickly, reducing the work time. According to the layout planning of the building, combined with the analysis and design of the pre-design site, the BIM technology is used to simulate the sunshine and ventilation, to design the orientation and spacing of the building, and finally select the best layout of the building. For the scheme comparison, we use BIM technology to carry out preliminary energy consumption simulation, performance analysis of the model comparison scheme, and with green building energy-saving experts, energy consultants, equipment engineers to help optimize analysis to select the

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best building plan, so as to become a true green building energy-saving[15].

4.2.2. Strategies for the application of 2BIM technology in the design phase of energy-saving solutions for green buildings

1) Architectural form design

With the continuous development of social economy, People's requirements for building appearance are not only simple square shape, but also practical and beautiful, even require the building to have some spiritual symbol or hope that the building can become a symbol. Like the Beijing Olympic Games stadium-the bird's nest and other forms of complex logo strong buildings. And like these complex buildings, we should not only consider the rationality of the building shape, the practicality of the internal structure, but also consider the design of the building shape, to achieve the goal of building energy efficiency. At this time we need to use the BIM technology of parametric design and visual design of rapid conceptual modeling.

In Revit software, there is a function of parametric design-adaptive function. This function is in the adaptive family according to a number of points for component positioning and modeling, loading other components after the family. By picking up the target points in sequence, the original designated points can be corresponded to the something punctuation points one by one, and the shape adapts to the new geometric components actively. Under the control of some parameters, the adaptive family can make a regular body or skin effect, or even add the changes of parameters to get unexpected complex results. The advantage of parameterized design is that the system can maintain all the invariable parameters automatically and ensure the harmony of the information when the model is modified by variable parameters. Therefore, the design work efficiency network is greatly improved.

2) General layout

In the early stage of the architectural design, we carried out site analysis and surrounding environment investigation, for the general layout of the building, should be combined with the BIM technical site analysis and site environment data in the early stage of the design, further through BIM technology of sunlight and ventilation simulation, scientific and effective design of building orientation and building spacing, the overall layout of the building.

(1) orientation

The geographical environment, site conditions and site climatic characteristics are all the factors that affect the orientation of the building, among which sunshine, ventilation and thermal radiation are the main climatic factors that affect the orientation of the building, choosing a good building orientation is the premise of building energy efficiency. In the early stage of the project design we use BIM technology, very scientific analysis of the project site climate conditions. Next should be based on pre-site climate data, combined with sunshine, ventilation, thermal radiation analysis to determine the best orientation of the building. For sunlight analysis, the relationship between the orientation of the building and the sunlight can be reflected by the sun-orbit chart,The direction of the arrow indicates the orientation of the building, and the gray areas indicate areas where the sun can not reach, the red area indicates the range of solar angle in winter, and the smaller the area where the red area intersects with the gray-white area, the larger the range of solar radiation in winter. Figure 1 shows the orientation of the building in terms of the extreme values of year-round sun exposure and year-round sun exposure.

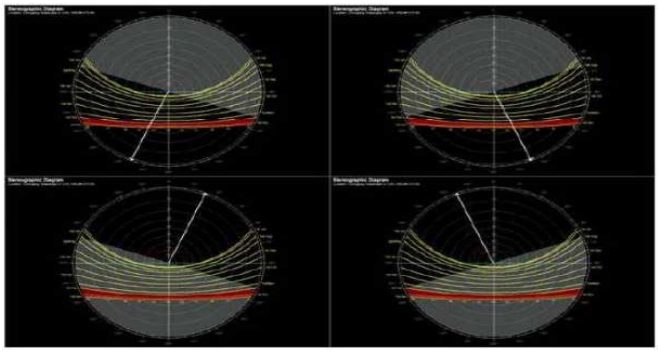

Figure 1: Building orientation and h-ray

For ventilation analysis, good indoor thermal comfort is generally determined by reasonable and appropriate building ventilation, so when designing building orientation, the relationship between

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building orientation and summer dominant wind direction should be especially considered, in order to facilitate the organization and use of indoor ventilation. The weather tool of Ecotect can analyze the dominant wind direction in winter and summer in the project area.

The best orientation of the building is determined by not only having a long sunshine time in winter, but also avoiding too much sunshine in summer, and meeting the requirements conducive to the natural ventilation of the building. According to the comprehensive simulation, the best orientation in Changchun is 30south by east and 10 south by west. It is suitable to face 45 south by east, 45 south by west and not to face north, northeast and northwest. However, specific analysis shall be carried out in combination with the site environment for specific projects. At the same time, we also need to use BIM technology to analyze the energy consumption, compare the energy consumption of multiple schemes, and constantly improve the optimization design.

4.3. BIM technology in the green building energy-saving construction drawings design phase of the application research

4.3.1. Bim application points in the design phase of green building energy-saving construction drawings

In the stage of construction drawing design, the main design content is to use BIM building information model as the carrier of design information, to integrate various specialties such as architecture, structure and equipment, and to deepen the design in coordination, check each other, especially with the help of BIM technology pipeline integrated and conflict inspection, which can effectively avoid the construction of pipeline collision, rework, waste construction time, etc. , from the energy-saving design concept of green building point of view, but also save the building materials, for the green construction has made a good guiding role. For large-scale and complicated green projects, BIM technology in the construction drawings design phase of pipeline synthesis and conflict inspection than the traditional two-dimensional design has great advantages.

(1) design visualization

The BIM information model covers the physical, geometric and functional information of an item. The visualization can extract the above information directly from the BIM model, and the visual model can be changed with the change of BIM design, ensure consistency between visualization and design. In the comprehensive layout of pipelines, the location and elevation of pipelines can be clearly marked by the advantage of visual design, and once the height distribution of the floors can be visually seen, the problems that are difficult to find in two dimensions can be found, the indirect optimization design can control the increase of collision phenomena. Carry on intuitionistic and reasonable equipment pipeline arrangement, reduce the conflict between professional pipelines.

(2) pipeline integration and conflict inspection

BIM technology makes use of the function of collision detection in the comprehensive design of pipelines to thoroughly check all the collision problems among different specialties, and feedback them to designers, owners and experts in time, so that they can timely coordination and communication, adjustment, timely elimination of all collision problems in the item.

4.3.2. Strategies for the application of 2BIM technology in the design phase of energy-efficient construction drawings for green buildings

The comprehensive layout of pipelines is a process in which the pipelines and equipment of various disciplines in the building space are arranged as a whole in the drawings, documents or models according to the construction and installation requirements, functional requirements, operation and maintenance requirements of pipelines of different disciplines, taking into account the constraints of architectural structure design and indoor design. With the development of society, modern buildings need water, electricity, air conditioning and other equipment pipelines in order to meet people's higher living needs. With the development of the Internet, the construction of smart cities, networks, monitoring and other intelligent system pipelines are also increasing. In the limited space, there are more and more pipelines. With traditional two-dimensional design, it is difficult to express accurately only by two-dimensional plan, which will easily lead to collision, affect the construction progress, waste time and affect the project cost.

The collision inspection and analysis software is mainly Autodesk Navisworks Manage. Using Autodesk Navisworks Manage can well solve the unavoidable errors, omissions, collisions, collisions

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and other phenomena under the traditional two-dimensional design. Adjust the pipeline according to the collision detection report. In order to meet the design and construction specifications, reflect the design intent, meet the requirements of the owner and maintenance and overhaul space, so that the final model is displayed as "zero collision". When viewing the collision, set the highlight color of the collision item, and view the collision according to the collision status.

5. Conclusion

Based on the research of BIM technology and energy-saving theory of green building, this paper summarizes the problems in traditional energy-saving design of green building, and analyzes the work flow of energy-saving of green building based on BIM technology, to solve the traditional green building energy-saving bottleneck problem. Overall, the idea of this paper is to BIM technology in green building energy-saving design practice-oriented, to green building energy-saving design time sequence as the main line, bIM technology application research is divided into pre-design stage, scheme design stage, preliminary design stage and construction drawing design stage.

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