

Research on the application of "BIM technology +assembly structure" in emergency building

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Abstract

With the development of information technology in construction industry, BIM Technology and assembly structure, as the rising stars in recent years, have been developing rapidly, these innovative technologies have not only led the construction industry to a more efficient, green and modeling direction, but also injected new ideas into the design concept of emergency buildings, this paper expounds the practical application of the combined technology in the emergency building, sums up the advantages of the technology in the emergency building, and makes some reflections on the better application of the technology in the emergency building in the future, it is hoped that this technology can play a greater role in the field of emergency construction.

Keywords

Emergency Building; BIM Technology; fabricated structure.

1. Introduction

At the beginning of 2020, an unprecedented infectious disease came suddenly. As of January 23, 2020, within less than one month of the outbreak, the number of confirmed cases in one city in Wuhan alone has reached 444. The authorities have quickly taken measures to announce the "closure of the city" order to prevent the epidemic from continuing to spread wildly. As of January 27, the number of confirmed cases has reached more than 4,000 from a few hundred at the beginning. Medical facilities in Wuhan are in emergency, and medical staff are in urgent need of support. Medical rescuers and resources across the country have started either spontaneously or accepting deployment. Going far to Hubei, the country has formed the most beautiful scenery of retrogrades. However, the problem of serious shortage of hospital beds urgently needs to be solved, so Wuhan decided to build Wuhan's "Xiaotangshan Hospital" --- Huoshenshan Hospital. The project started on January 23. The planned construction area is 34000m² and can accommodate 1,000 beds. It will be officially delivered in eleven days. At the same time, on January 25, the construction area of Leishenshan Hospital, which has a construction area of 75,000 square meters and can accommodate 1,500 beds, also officially started construction, and was officially completed and delivered on February 5. What is the concept of building a hospital in ten days? This "Chinese speed" can't help but amaze the world. In addition to the day and night battles of thousands of builders, there is also a strong technical support-BIM and assembly technology. These buildings not only highlight the advantages of architectural integration and industrialization, but also inject new ideas into the design concept of emergency buildings.

2. Overview

2.1. The meaning and characteristics of fabricated structure

Prefabricated structure refers to a combination of building components and accessories (such as walls, slabs, beams, balconies, columns, stairs, etc.) in the factory for processing, and then transported to the construction site, where they are combined with a reliable connection

method. Kind of structure. Compared with the traditional construction method, this construction method adopts standardized design, factory production, and assembly construction, which makes the whole process more informationized and intelligent, reduces a lot of on-site work, and has high efficiency, fast speed, energy saving and emission reduction. , Green and environmental protection.

2.2. The meaning and characteristics of BIM technology

BIM technology, or building information modeling technology, refers to the formation of a model by inputting all the engineering data of a building project, including various related information from the building design stage to the later operation, maintenance and management, into the platform, and realizes the information sharing and sharing of building information in different departments and stages. Data transfer. In recent years, prefabricated buildings have gradually emerged. This new type of construction requires close coordination and connection in all aspects and stages, which puts forward higher requirements for building information management. BIM technology provides an efficient platform for prefabricated buildings. The main outstanding features of BIM technology are spatial visualization, component parameterization and scene simulation.

2.3. The meaning and characteristics of emergency buildings

As the name suggests, emergency buildings refer to shelters that people need after emergencies, such as natural disasters or social unrest. As a transitional building, emergency buildings have the characteristics of flexibility and adaptability. It plays a vital role in post-disaster rescue work. The characteristics of easy access to materials, quick realization of construction, and humanistic care are indispensable and important factors for emergency buildings.

3. Advantages of "BIM technology + prefabricated structure" in emergency buildings

3.1. Design phase

3.1.1. Visualized space simulation, optimized design

Traditional architectural planning is mainly based on two-dimensional drawings. It is difficult for designers to plan as a whole from an overall perspective, which leads to unsatisfactory planning effects. The use of the visualization function of BIM technology not only displays the relationship between the hospital and the surrounding site more intuitively, but also simulates the internal space layout of the building, which helps designers make overall plans and make reasonable spatial planning plans. In the early stage of the design of the project, in order to better understand the situation of site leveling and spatial positioning in the later stage, the designer put the 3D information model of the project in BIM according to the project specification and the geographical conditions near the site. It is presented in the software to analyze the relationship between the building and the site. In the BIM software, not only the building layout and site planning of the project can be simulated, but also practical plans are made in the organization of transportation routes. design.

In addition, unlike ordinary public buildings, the Huoshenshan and Leishenshan projects are emergency buildings in the event of an outbreak, and also emergency hospitals for infectious diseases. Therefore, not only a large number of large-scale medical equipment and other standard facilities, but also airtight virus isolation areas need to be arranged inside. We must also attach great importance to it. In order to meet such requirements, the designer puts forward the principle of "diversion of doctors and patients, diversion of characters, and diversion of cleaning and pollution", and designed a pattern of "three zones and two passages" to avoid cross-infection and form an independent space. Clean corridors are set up, and each

ward is also equipped with corresponding living facilities and independent toilets. Therefore, the internal layout of the hospital is intricate and complicated, and designers need to use the 3D rendering roaming function in the BIM software to observe the entire hospital from multiple angles, make accurate analysis, judgment, improvement, and optimize the space.

3.1.2. Visual collision check to avoid rework

Traditional architectural design is a phased and one-way design. Only after the upstream design is completed can it be passed on to the downstream for communication, resulting in frequent component collision problems in the design and affecting later construction. The BIM technology provides a platform through which all professional designers can carry out collaborative design through the platform to complete the establishment of the BIM model and complete the construction drawing design to avoid errors, omissions, collisions, and deficiencies caused by poor communication. It greatly improves the design accuracy and design efficiency, shortens the design time, and provides a strong guarantee for the smooth implementation of the project "exploration, design, and construction". For the "time is life" Huoshenshan and Leishenshan projects, Important. On the one hand, BIM can provide a platform for designers in various fields such as architecture, structure, communication, water supply and drainage, strong electricity, heating and ventilation, to avoid information asymmetry due to different majors. On the other hand, , Enter the required material information into the platform, provide it to the relevant manufacturers, and make a production and transportation plan.

In the "Er Shenshan" project, not only the common systems of general buildings such as drainage and fire fighting, power supply and distribution, lighting and monitoring, ventilation and air conditioning, and weak communication for communication, but also the unique systems of infectious disease hospitals must be considered. Such as gas engineering, purification engineering, sewage treatment, etc., which makes the pipeline system of the entire project numerous, huge, and intricate. Once the pre-design arrangements are unreasonable, problems will be encountered in the later period and rework, which is absolutely not allowed for emergency buildings such as "Er Shenshan". The visual collision check function in BIM software can perfectly solve this problem, reduce errors and omissions, simulate the most reasonable pipeline system layout plan, avoid later rework, and improve construction efficiency.

3.2. Component production stage

3.2.1. Model processing components to improve efficiency

The conventional processing process of prefabricated building components is: counting the number and specifications of components → forming processing drawings → factory processing components. The main disadvantage of this process is that it takes a long time to form the processing drawing, and the processing according to the two-dimensional drawing is prone to errors, which leads to the failure of on-site assembly. BIM can classify and store the associated building information. The component processing factory can directly export component statistical reports through the BIM model, and can simulate the component production plan based on the BIM construction progress simulation, so that the production plan and the construction progress can be unified, and avoid labor or waste. Discontinued. The digital processing flow based on BIM technology can not only effectively improve the processing accuracy of components, but also greatly shorten the processing time of components. It provides an important time guarantee for the scheduled delivery of the Huoshenshan and Leishenshan projects.

3.3. Construction phase

3.3.1. Simulation of the whole process, optimization of construction plan

Prefabricated building construction is characterized by a large number of components, heavy lifting workload, and high requirements for assembly accuracy. A series of problems such as improper lifting sequence and component assembly errors may occur during the assembly process. Once these problems occur, the construction progress will be seriously affected. In addition, the plane layout of the components is also very important. The orderly approach and reasonable stacking of the components will affect the lifting efficiency to a certain extent, thereby affecting the construction progress. The construction period of the Huoshenshan and Leishenshan projects is very tight, and there is no room for mistakes and rework. Before the formal construction, BIM technology can be used to simulate the construction to verify the existing component hoisting sequence to ensure its rationality. At the same time, the key construction nodes can be found through the simulation animation, and the construction personnel can be intuitively and easily understood to ensure that there is no error and no rework in the component assembly process. Achieve high quality and rapid construction.

3.3.2. Information management to ensure that dozens of processes go hand in hand

The BIM information management adopted by the Huoshenshan and Leishenshan projects dynamically manages every step of the construction process, thousands of workers on site, and nearly a thousand large-scale machinery and equipment and transportation vehicles to ensure dozens of processes in the project. Orderly work, go hand in hand, and resolutely do not waste a minute, which provides a guarantee for the project to be delivered on schedule.

4. "BIM technology + prefabricated structure" combined with emergency buildings to pay attention to issues

Since 2015, my country has begun to vigorously promote BIM technology and prefabricated buildings. The two have gradually become the focus of the construction industry. The rapid completion of the Vulcan Mountain and Leishen Mountain projects has further increased people's attention to these two technologies. It also showcases the many advantages of this innovative combination, such as high efficiency, good quality, less site operations, and green environmental protection. Therefore, in order to better apply this combined technology to emergency buildings, it is also necessary to focus on the training of corresponding technical personnel. In the future, the construction industry will develop in the direction of industrialization and digitalization, and more talents with knowledge of "BIM technology + fabricated structure" are needed. At present, there is a shortage of talents with corresponding capabilities in the market, so it is necessary to increase the training of professional talents. Strengthen, actively expand the professional talent team, and provide technical and talent guarantee for the better combination of "BIM technology + prefabricated structure" and emergency construction.

5. Conclusion

The successful completion of the Huoshenshan and Leishenshan projects has fully demonstrated the advantages of prefabricated buildings and BIM technology. However, the research on the deep integration of the two has just started. On this basis, we should further integrate BIM technology and prefabricated technology. The structure allows them to give full play to their advantages in more fields.

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