Measures for the optimization and management of construction safety based on BIM technology

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Abstract. BIM technology is a kind of new technology application that runs through all kinds of engineering design, construction and follow-up management, and in the course of popularizing and applying the relevant application technology in the past two decades, it has played an important supporting role in promoting the development of China's construction industry. With the continuous improvement of the development depth of related software, BIM technology has also played a great role in the construction safety management of construction. Based on the advantages of BIM technology application, combined with steel structure construction and assembly concrete construction, this paper puts forward the optimization measures of construction safety management, and makes due contribution to the improvement of quality control level in China's construction industry.

1. Introduction
BIM technology is called building information model technology, its practical application in the field of construction has a long history. With the improvement of its application technology level, BIM technology will fully replace the traditional CAD technology and is widely used in various fields of architecture. In the construction safety management, it is a very necessary work to optimize the construction safety management measures by applying the specific processes such as the preparation and optimization of safety management plan, safety activity monitoring, early warning of safety hazards and evaluation of overall safety work, combined with the actual characteristics of BIM technology. In the process of practical application, BIM technology has the function of visualization, simulation and excellent optimization, which can provide detailed technical support for construction safety management, and deepen the theoretical analysis in this field, which is the inevitable requirement of practical work.

2. The benefits of BIM technology in security management
In the construction safety management work, there are problems in the traditional management mode, such as lack of prediction, poor overall controllability. And the overall work level is more dependent on human factors. There are also shortcomings in the detail, the lack of science and the lack of systematicness in carrying out the work. All of these lead to the overall management inefficiency, safety management accidents are frequent and other phenomena. BIM technology itself has 3D visual function, can simulate the construction link, use the collision function of the software internal to check the...
construction design plan, the specific application of these functions, can be targeted to solve the shortcomings of the traditional management scheme, effectively avoid the hidden dangers in the construction process, comprehensively improve the level of safety management, better reflect the "people-oriented" safety management concept requirements, but also can better improve the efficiency of construction safety management, improve the economic and social benefits of construction enterprises. The application of BIM technology to various types of construction projects has become an inevitable trend in the development of China's construction industry, from January 2018, China's first detailed national standard of rules applied to the field of construction engineering "Application Standards for Construction of Building Information Models" began to be formally implemented, which also established the guiding direction for the practical application of BIM technology in all construction links of construction.

3. The Optimization of the Safety Management of BIM Technology in Steel Structure Construction

3.1. Analysis of the type of steel construction accident
Steel structure is an important type of building construction, under the support of the great potential of industrial and logistics industry development, the steel structure construction market will continue to expand, the construction type is constantly complex, and the resulting construction safety hazards will be more prominent.[1]. According to the technical analysis, there are usually several safety hazards in the construction of steel structure. First, the overall support system will collapse or dump, in the steel structure self-weight beyond the temporary support system design load value or support system by external forces, there will be a safety hazard in this regard. Second, the lifting accident, in the building process of steel structure construction, lifting operation is a dynamic process, for the operator's comprehensive quality requirements are higher, in the case of improper operation or processing is not in place, there will be an accident lifting accident. Third, the collision accident, which is also the more common type of accident in the construction process of steel structure construction, the seriousness of the consequences of such accidents has a great difference, and has a greater impact on the realization of safety management objectives. Relying only on the traditional management mode, the control of these security risks is lacking, therefore, with the help of the application of BIM technology to improve the level of safety management, is the construction safety management work to carry out scientific development of the inevitable trend.

3.2. Measures optimization of BIM technology in steel construction safety management
Combined with the building characteristics of steel structure construction projects and the basic requirements of BIM technology application, the optimization of overall measures usually contains the following aspects of the content: First, do a good job in the collection and collation of basic data, to lay the necessary foundation for the practical application of BIM technology so as to ensure the accuracy of BIM technology application process. The second is the optimization of the modeling process, which is mainly to select the corresponding modeling software to ensure the convenience of data exchange in each process, to avoid the situation of secondary modeling. Third, optimize the construction program. According to the collision function of BIM software, the emphasis is on the inspection of some new technologies and complex processes to ensure that managers can more intuitive and in-depth understanding of the construction program problems, so as to do a good job of preventive measures. Fourth, simulation analysis of construction process, in this link, the focus needs to pay attention to lifting and assembling work, to take active measures to deal with insufficient or security risks in lifting,. In the assembly calculation, we should focus on analyzing the load type and combination mode of the key parts during the construction process, so as to ensure that the simulation process can maintain a high degree of consistency with the scheme design. Fifth, carry out the necessary safety technology bottom-up work. With the help of 3D model for the safety training of construction personnel, distinguish the labeling to the danger sources where we need to pay more attention to, strengthen the safety production
awareness of construction personnel in different presentation methods to improve the level of safety management work. Finally, take BIM technology as a support, do a good job of the whole process of on-site construction inspection work, and the deviation of practical operation and design requirements should be handled in strict accordance with the relevant standards, also a systematic safety management system should be established.

4. BIM technology in the assembly concrete construction of the safety management optimization

4.1. Analysis of safety factors in assembly concrete construction
Assembly concrete construction technology has changed the traditional construction type to the main way of on-site production construction, in line with the development of China's construction industry green energy-saving technology requirements, in the future construction industry, especially in high-rise construction projects have a broad market prospects [2]. The construction process of assembled concrete building mainly includes the production, transportation, site stacking, lifting and on-site connection of prefabricated components, which is different from the traditional construction process, resulting in corresponding changes in the construction safety factors. On the whole, these factors include people, materials, technology, management and the environment, and problems in only one section of these details can have a serious negative impact on construction safety. Most of these problems occur in the dynamic operation of construction, while traditional management is static, resulting in serious dislocation between the two.

4.2. Measures of BIM technology in the safety management of assembly concrete construction
In the BIM technology applied to the construction safety management of assembled concrete construction, it is necessary to strengthen the combination of the two, increase the input in four aspects, in order to improve the overall level of safety management. The first is to increase the optimization of safety education and training. Based on BIM technology to carry out safety education and training for construction personnel, changed the traditional training methods to preach and rote hard back-based form, with VR technology in-depth combination, creating a realistic image of the three-dimensional construction scene, but also can deliberately set the corresponding safety hazards, strengthen the construction personnel's emotional awareness of safety accidents, so the personnel may build more intuitive sense of safety knowledge, improve the overall effectiveness of safety education activities [3]. The second is to strengthen the optimization of the safety emergency evacuation link, BIM safety information model can use virtual technology to create a realistic scene that fits the construction environment, but also can calculate the different emergency scenarios need to evacuate the path and time, according to these basic data, designers can set more scientific safety emergency plan parameters, for the non-satisfaction of emergency evacuation requirements, timely scientifically adjust construction of the building's exit settings, until to meet the needs of safety emergency management in the construction. The third is to improve the scientific layout of the construction site, based on the assembly concrete technology to carry out construction, construction site material turnover rate is high, for the management of the development has a higher requirements, the BIM technology used in this management link, can effectively reduce the material facilities on the construction site, as far as possible to reduce the arrangement of temporary facilities, more reasonable planning of the construction site inside the transport route, not only to ensure that the site layout program to meet the technical safety and fire protection requirements, but also improve the overall turnover efficiency, effectively enhance the operating efficiency of construction enterprises. The fourth is to optimize the overall construction plan [4]. The optimization of the assembly concrete building construction scheme is also achieved by means of collision detection function in BIM software, the main contents of collision detection include the collision between the model of prefabricated components and the external facilities of the building main body, the collision between prefabricated components and mechanical and electrical equipment, etc. BIM technology is able to give a more intuitive indication of possible safety hazards during actual
construction, and optimize the details of the construction plan in advance so as to improve the overall level of safety management.

5. conclusion
With the continuous improvement of the details of the construction safety management work, BIM software technology is also gradually improving, it covers all aspects of construction management, but in the current construction safety management work, the application of BIM technology is still seriously inadequate, the relevant technical personnel is relatively lacking. This not only results in poor practical application effect, but also can not meet the needs of China's construction and construction safety management work. How to adapt to the requirements of safety management work, increase investment in BIM technology, increase the investment in human resources in this area, is an important aspect of the safety management of construction enterprises need to pay attention to, so as to truly ensure the stability and rapid development of China's construction industry.

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