Application of BIM Technology in the Construction Phase of Steel Structure Engineering

Zhan Zhenguang
Sichuan Vocational and Technical College, Suining, Sichuan, 629000, China
tg667788@xzcstudio.com

Abstract. At present, the continuous development of the construction industry is inseparable from the support of BIM technology. In the construction industry, the construction of steel structures is particularly prominent. With the rapid development of steel structure engineering and the continuous advancement of technology, the technology of BIM has been produced. It is the integration of the two that led to the BIM technology. Only in this way can it play the key to ensuring quality in the construction of steel structures, so it can be said to be an indispensable technology. Therefore, the application of BIM technology in the current steel structure engineering construction can be very beneficial to improve work efficiency, quality assurance and project inventory budget. For this reason, this article analyzes and recommends the application of BIM technology in steel structures.

1. Introduction
With the progress of our society, a well-off society has been achieved in an all-round way. The development of the social economy cannot be separated from the development of the construction industry, and the construction of the factory is even more inseparable from the construction and application of steel structure projects. As the country continues to develop, the per capita income continues to increase, and science advances, so the construction of the project has also increased the strictness and technical requirements in the BIM technology. From the construction of the model, the drawing requirements of the drawings, the accuracy of the engineering materials, and the foundation construction, the final capping of the house construction cannot be separated from the support and application of BIM technology.

2. Concept and application of BIM technology

2.1. Introduction to BIM technology
BIM technology is also known as three-dimensional modeling technology in the industry. It is also the identity card of construction workers, an effective work platform in the construction field, a medium for business and learning exchanges in the construction industry, and a team technical certificate for various construction personnel. The strong display of construction professional and technical personnel is also the promotion of policy. BIM technology is also the expression method of building information model for the functional characteristics of steel structure projects and the digitalization of the implementation of physical construction. The concept of BIM technology is to establish a digital library of information throughout the life cycle of the project, so as to realize the sharing and aggregation of information between various stages and different fields, so as to achieve full transparency of the project progress, which was issued by the Ministry of Housing and Urban-Rural
Development in 2015 Document No. 159 Guiding Opinions on Promoting the Application of Building Information Models. It emphasized the importance of the application of BIM technology in the construction field, and clearly promoted the application and development goals of BIM technology, and proposed for construction, design and construction units instructions.

2.2. Building information model
Three-dimensional modeling technology (Building Information Modeling, BIM) technology uses artificial intelligence technology to realize the effective transmission and sharing of building technology through the creation and use of 4D models of building information. It is also the management and method of building development, architectural design, building construction and construction management based on building information modeling (BIM), and runs through the entire life cycle of the building. BIM professional technology integrates relevant information of all projects through 4D data models. Sharing and transmission are carried out during the whole life cycle of project planning, operation, management and maintenance. Engineering and technical personnel can make correct and effective judgments and practices on various information that appears. It can coordinate the work for the design team, the construction team and all parties including the building management unit. BIM technology plays an important role in improving efficiency, saving cost, ensuring quality and shortening time limit.

| The inspection lot division of steel structure follows the principles |
|---------------------------------------------------------------|
| 1. Single layer steel structure is divided according to deformation joint |
| 2. Multi storey and high-rise steel structures are divided by floor or construction section |
| 3. Profiled metal plate engineering can be divided into roof, wallboard, floor, etc |
| 4. For the acceptance of raw materials and finished products, the inspection batches can be combined or decomposed according to the project scale and the actual situation of the incoming materials |

Figure 1. Inspection and approval principle of steel structure sub-project

2.3. Policy on BIM technology in steel structure engineering construction
The Ministry of Housing and Urban-Rural Development issued Decree No. 92 in 2014, Decree No. 159 in 2015, Decree No. 183 in 2016, Decree No. 1380 in 2016, Decree No. 1534 in 2017, Decree No. 1535, Decree No. 312 in 2018, and Decree No. 19 of the State Council in 2017. It emphasized that BIM technology is required. At present, not only steel structure engineering projects in society involve BIM technology.

3. BIM significance of steel structure construction

3.1. Conducive to improving the quality and efficiency of the steel structure construction team
In the construction of steel structure projects, the use of BIM technology to manage and inspect is the in-depth design of the steel structure and the post-prefabrication installation. In-depth design generally involves the construction of relevant information data and 4D three-dimensional modeling, and the installation and combination of the various designed components. Finally, detailed data maps and tables are drawn to provide more accurate information and quotations for the construction team and the procurement department. Therefore, in the construction of steel structures, BIM has played a role in quality control and improvement of work efficiency, thereby greatly saving time.
3.2. The organization of BIM technology in steel structure engineering

1. Preliminary concept of the project: simulation analysis of the geographic location of the project, visual display, etc.
2. Reconnaissance surveying and mapping stage: area detection in visual simulation, address parameter analysis and plan design, etc.
3. Construction project design: parametric design, daily consumption analysis, route planning, hydropower pipeline design, building structure, wind direction analysis, environmental analysis, cost analysis, green environmental protection, program presentation, building simulation, etc.
4. Construction stage: construction simulation, optimization of the environment, construction safety, construction progress, real-time feedback, automation, supplier management, site layout, construction waste treatment, etc.
5. Project operation stage: intelligent building facilities, services for the people, etc.
6. Project maintenance.

3.3. BIM technology is conducive to coordinating the sustainable development of steel structure construction

BIM technology will play a major role in the 10 years from the national emphasis in 2016 to the future development of the industry. At present, BIM technology has just started but the technology has been quite mature after 6 years of continuous scientific development. Therefore, it will play a major intuitive role in the future industry field.

4. Analysis of BIM strategies in steel structure construction

4.1. Application of BIM technology in deepening steel structure design

In terms of deepening the design of steel structures, BIM technology is prerequisite for subdividing every step and every work to ensure the smooth progress of future design and construction. For example, the detailed site leveling, design drawings, the division of pile foundations, the construction and splicing of steel structures, the construction of the roof, the prefabricated components and the strength standards are used to deepen the design and subdivide the details of each item.

For example, in the application of BIM technology in the deepening design of steel structure engineering, the entire process of splitting and collocation requires multiple software applications, such as CAD Glodon, TeklaXsteel, 3D and other software for common use, so it must do a good job preparation for corresponding work. In the detailed drawings of the deepened design of steel structure
construction, BIM technicians can use the visual interface to design three-dimensional building models of scale and show the overall situation of the steel structure to us. It can use related technology to split the steel structure components to show the important task points of detail splicing and construction in detail, so as to minimize the risk and maximize the efficiency. It can be familiar with the detailed parameters of the accessories to check the qualification of the accessories and achieve the safety-first construction essentials and deal with some unnecessary factors in a timely manner through the technical inspection function of the BIM software. Then the risk factor is greatly reduced, and the in-depth design concept is completed, so that the construction and installation can be carried out in a safe and orderly manner. The information transmission of the detection components is also inseparable from the support of BIM technology. The completeness of the information data makes the necessary data of the size, material, shape, compression test grade. The components are prepared for the next construction and installation.

4.2. Application of BIM Technology in the modeling phase of steel structures

Architectural model is the most important part of steel structure construction. It is one of the most basic tasks based on the issuance of construction blueprints, detailed adjustments and even cost budgets. In the architectural model stage, the advantages of BIM technology are very prominent. Compared with the traditional CAD Glodon, it is much simpler and clearer, so it will be mandated by the national government. For example, the two major advantages of BIM visibility and 3D modeling simulation are listed earlier in this article, and it is precisely these two advantages that have played a great role in the field of modeling work. It can let the staff understand the basic situation of the modeling and determine the various data and reports of the project construction. For example, in a project in the south, the modeling was completed. Because most of the rainy weather in the south is frequent, BIM technology is used to detect the rain-proof, moisture-proof and corrosion-proof performance of the steel structure, as well as the difficulty and safety of the construction in rainy weather. If it is found that the anti-corrosion and moisture-proof conditions do not meet the theoretical requirements, rectification should be carried out as soon as possible, and the construction can be safely carried out after the rainy day operation is detected. But in order to start carefully, it must achieve solid quality control and slow down the progress of other indoor operations, such as prefabricated components, inspecting component strength, to speed up the construction progress and realize the construction schedule adjustment without delaying the construction period. This technology has obvious advantages in the field of BIM technology. In the construction phase, the application of BIM technology mainly includes some details such as detail adjustment, reserved holes for the next construction. Under the strict requirements of material control, more reasonable arrangements and data analysis have been made for the local environment, weather, topography, and policies. The drawings and 4D models under the control of BIM technology will have obvious three-dimensionality and hierarchy, which is more obvious and prominent. This is the most unique advantage of BIM technology, and it is also the process of visualization technology. The BIM technical staff first use the software to model the overall 4D model and the data of various beams, columns, walls and ceilings and reserved holes, so it is easier for the construction personnel to understand the details of the project, which eliminates some unnecessary factors.
4.3. Application of BIM technology in steel structure assembly

The 4D model of BIM technology is used to divide the construction situation in detail. After the theoretical demonstration is carried out using the 4D model of BIM technology, the management system and management technology of BIM technology are used to carry out the error-free installation and construction of the site. The third step is to use the risk experiment of BIM technology to carry out a series of experiments such as the maximum degree of resistance to pressure and wind, and strengthen and test on-site preventive measures. Finally, an all-round inspection is carried out through the 4D model of the maintenance system, and finally on-site maintenance and maintenance.

For example, in the case of assembly and hoisting of steel structures, detailed data analysis of construction drawings and installation risk avoidance are carried out through the BIM technology 4D model. These analysis data are displayed in front of us through BIM, so as to effectively carry out the management and the lifting and installation of the steel structure. When a 4D model through BIM technology is built, it can more effectively understand the type of component and the form of the component structure. Through the BIM information database, the engineering quantity and budget list of all components can be calculated quickly and accurately, which is faster and more convenient and more in line with the national standards for manufacturing prefabricated components. This article states and analyzes the low-rise steel structure, so it will involve the use of tower cranes. The size and segmentation of prefabricated components, the lifting standards of the tower crane, and the occupation and arrangement of the lifting position have a huge impact on the construction process, and the lifting of the tower crane is even more important. The BIM technology has just the right full coverage. The BIM technology combined with the construction plan for construction simulation assembly brings more comprehensive implementation to the construction, and greatly reduces the safety risks in the construction and avoids them.

5. Conclusion

Based on the above analysis and application of BIM technology in building steel structure engineering, it can be familiar with the relevant basic content. The maturity and stable development of BIM technology is a major breakthrough in the field of steel structure engineering construction and development, and also brings more informationization mode to the staff. It can let the construction become more and more simple and clear, the connection of each step is also more mature freely. The use of BIM technology in the construction of steel structure engineering projects can better ensure the coordination between steel structure process and structural design, and ensure the clear connection.
between the calculation model of steel structure and the data of structural design, which can better reflect the advantages of BIM technology. This paper also analyzes the construction and application of BIM technology, and puts forward the applicable scheme and advantages. At the same time, it also makes a very good foundation and scheme for further construction management, construction schedule, construction maintenance, construction period and construction safety.

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