



Application of BIM Technology in Bidding Management of Engineering Projects--Taking Shenyang Evergrande Times New City Project as an Example

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Abstract. Bidding is a crucial step in the whole process of construction of engineering projects. It is directly related to the cost savings of the construction unit and the selection of the best bidding program. The quality of bidding documents directly affects the quality of bidding activities. By combining BIM technology with the bidding process and adding BIM models, the efficiency of bidding activities can be improved and costs and labor consumption can be reduced by analyzing the advantages of models and BIM technology.

Keywords: Bidding, BIM technology, Modeling, bill of quantities.

1 INTRODUCTION

Bidding is a crucial step towards standardization in China's construction industry. It plays a vital role in controlling project costs, improving the effectiveness and efficiency of resource allocation in the market, ensuring project quality, and promoting high-quality economic development. Since the implementation of the bidding system in China, transactions in the construction market have been conducted through bidding. Bidding documents serve as the foundation of the entire bidding process and are key to its success. The quality of bidding documents prepared by the bidding party will have a significant impact on the smooth implementation of the entire bidding process.[1].The main function of BIM is to create a three-dimensional model and then use software to automatically form various data for this model. The content of the data contains information such as material varieties and specifications[2].In the bidding stage, BIM technology is used to prepare an accurate and complete bill of quantities, and the calculation of quantities is the most time-consuming and energy-consuming work in the bidding stage. The use of BIM technology can make the completeness and accuracy of the bill of quantities, the reasonableness of the bidding control price, and the efficiency of the bidding and tendering activities improve, and at the same time, it saves a lot of time and energy.

2 OVERVIEW OF THE DEVELOPMENT OF BIM TECHNOLOGY AT HOME AND ABROAD

American expert Jerry Lesserin first proposed Building Information Modeling in 2002, Since then, the term BIM has been widely used in construction projects around the world[3].Prof. Bazjanacz began his research in 2006 on the application of BIM technology to the management of cost, schedule, quality, contract, safety and other aspects of a project, so that information can be shared and coordinated throughout the entire process of a project, from the initial planning of the project to the completion of its operation.BIM technology was first introduced in Finland, Norway, Singapore and other countries, and after a long period of development, BIM has gradually become the mainstream of the construction field in some foreign countries[4].BIM was first introduced into China by Autodesk in 2002, and has been developing rapidly in China since then. Software companies, design companies, developers, construction companies, universities and research institutes have set up BIM research institutes; Many projects in China have adopted BIM technology at different stages, and the Shanghai Center Building is a good example. During the whole process of the project, which was managed by the owner, BIM technology was applied in the whole project design, construction and operation. This is the first comprehensive application of BIM technology in China, which lays a good foundation for the promotion and development of BIM technology[5].Nowadays, many construction companies have discovered the advantages and benefits of BIM, so they usually require bidders to use BIM technology when bidding.BIM technology can improve the accuracy of the quantity of work, while the traditional calculation of the quantity of work is mainly calculated manually, which is time-consuming and labor-intensive.The calculation of BIM software has obvious advantages compared with manual calculation: the model is constructed by using BIM software, which can automatically generate the relevant data, improve the accuracy of the quantity of work, and reduce the labor. It improves the accuracy of the project quantity and reduces the labor force[6].

3 SPECIFIC APPLICATION OF BIM TECHNOLOGY IN BIDDING MANAGEMENT OF ENGINEERING PROJECTS

Formulating a scientific bill of quantities is crucial in the bidding management stage of engineering projects. By utilizing BIM technology, the amount of work can be accurately calculated by making use of information in the database. BIM models can be established to systematically analyze project components, avoiding errors and improving quantity calculation accuracy. The application of BIM technology in project bidding management enhances overall quality, particularly by improving calculation accuracy and reducing labor requirements. This saves time, mitigates risk in the bidding process, and promotes more accurate project budgets[7].

3.1 BIM Technology Software Modeling Shenyang Evergrande Times New City Project Model

Shenyang Evergrande Times New City construction project using BIM technology in revit and GTJ two software to calculate the amount of work, in revit software for the installation project modeling and volume calculations, in GTJ2021 software for civil engineering modeling and volume calculations, the following fig. 1 and fig.2 for the modeling results.

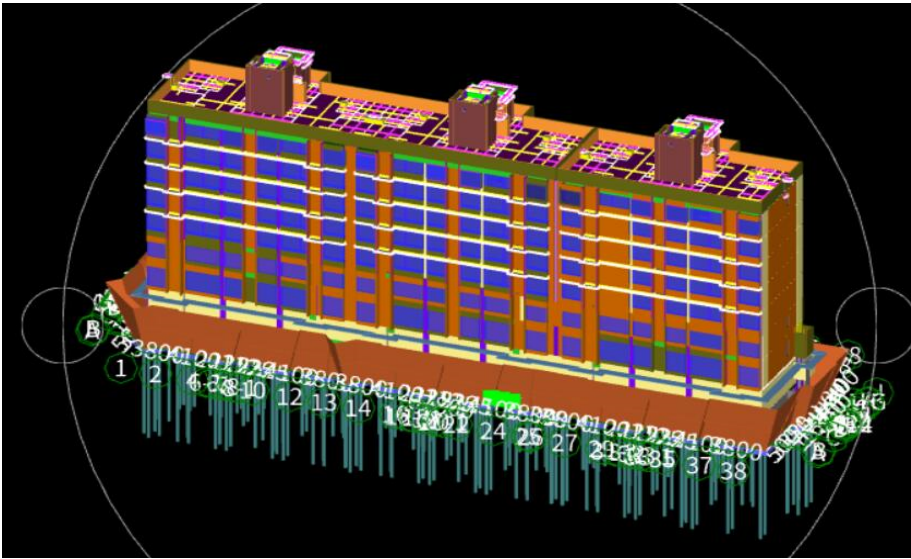


Fig. 1. GTJ model of Building 6 of Shenyang Evergrande Times New City

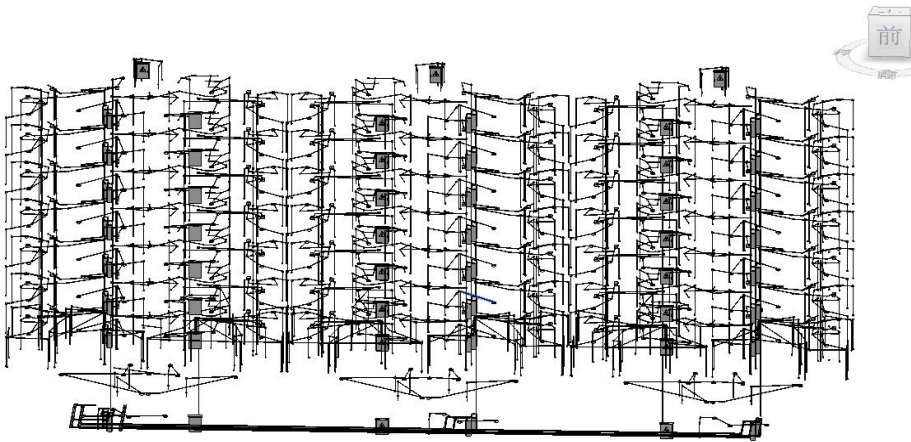


Fig. 2. Revit Model of Shenyang Evergrande Times New City Building 6 Installation Project

The results are summarized and organized through the accurate creation of Revit and GTJ software models, culminating in a list of itemized quantities.

3.2 Engineering Bill of Quantities of Shenyang Evergrande Times New City Exported by BIM Software--Taking Earthwork as an Example

In the construction project of Shenyang Evergrande Times New City, the work tasks of earthwork include site leveling, excavation, soil transportation and backfill. According to the project overview, input soil category, excavation depth, transport distance and so on in GTJ2021, and then use BIM software to model accurately, the bill of quantities of earthwork can be obtained, as shown in Tab.1.

Table 1. Partial bill of quantities of earthwork

number	Project Code	Project name	Project Characterization	measurement unit	project volume	Amount (yuan)		
						Consolidated unit price	Price	included Labor and Mechanical
	0101	earthwork						
1	010104001001	Leveling the ground	1、 Soil type: Class II	100m ²	9.64913			
2	010104003004	General earthmoving	1、 Soil type: Class II 2、 Excavation depth: 6.91m 3、 Job Description: Digging and loading	10m ³	753.6867			
3	010104003016	Excavation of earth for foundation pit	1、 Soil type: Class II 2、 Excavation depth: 2.385m 3、 Job Description: Digging and loading 4、 Location: Foundation beam, pile bearing platform	10m ³	49.9469			
4	010104006007	Transportation of earth by dump trucks Distance ≤ 1km	1.distance : 3km 2.Remove excess soil, Put the backfill next to it.	10m ³	615.6391			
5	010104006008	Dump trucks for earth moving Each additional 1km	1.distance : 3km 2.Remove excess soil , Put the backfill next to it.	10m ³	615.6391			
6	010103001009	backfill	1.Soil type: Class II	10m ³	187.99449			

The accuracy of the data in the bill of quantities is the key to the bidding process of the whole construction project, and the application of BIM technology can make reasonable use of the information in the database, and calculate the quantity of the project

quickly and accurately. At the same time, it can also systematically analyse all kinds of components within the project, avoid wrong data, and further improve the accuracy of the calculation results.

4 CONCLUSION

This paper analyzes the application of BIM technology in the bidding stage, understands the inevitable trend of computerization of engineering projects. BIM technology not only plays a facilitating role in architectural design and project management, but also promotes the bidding of construction projects to be carried out in an efficient manner, ensures that the bill of quantities and the bidding control price are accurate, prompts the bidding offer to be more reasonable, and strengthens the refinement of the bidding stage, reduce the conflict of interest between the bidding parties, and ultimately make the construction market scientific. Compared with the traditional bidding method, BIM technology has the characteristics of visualization, collaboration, parameterization, simulation and optimization, which can provide bidders and tenderers with more intuitive understanding, ensure the scientific and reasonable nature of bill of quantities and bidding control price, and be closer to the actual project.[8]. The implementation of BIM in construction is evidently a clear act toward digitalization, and it is expected that it will bring 13 – 21% savings in the design and implementation phase and 10 – 17% in the operation and maintenance within the global infrastructure market by 2025[9].

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