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Application of BIM Technology in Key Technology Quality Supervision System of Wooden Building Engineering

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Abstract:

Wooden building structure is widely used in construction engineering because of its good stability. Wooden building structure is widely used in construction engineering because of its good stability. In view of the shortcomings of traditional construction quality control and the development trend of BIM Technology, this paper puts forward the application of BIM Technology in construction quality control, so as to realize the application of BIM Technology in the whole process of construction quality control of construction engineering. On the basis of traditional quality control system, this paper constructs the application framework and application process of quality control system based on BIM Technology, which lays the foundation for the application of BIM Technology in the whole process of construction quality control. In this paper, BIM Technology and "PDCA" cycle method are used in the construction quality control, and finally realize the application of BIM Technology in the whole process of construction quality control. This paper analyzes and summarizes the solution degree of BIM Technology to the existing quality problems in the construction process, and the application highlights of BIM Technology in the construction quality control.

Keywords: *Wooden building structure, PDCA, BIM Technology , Quality Supervision System.*

I. INTRODUCTION

The process of construction quality control of construction engineering refers to the control of various work in the preparation stage and various factors affecting the construction quality before construction [1-2]. In the actual construction process, the real-time status and results of each construction element and construction technology activity are controlled, and finally the process control of products with independent use function and value is formed, namely, pre

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control, in-process control and post control.

With the development of quality management theory and information technology, although the construction quality control level of engineering projects in China has been improved, there are still many problems in the process of implementation.

(1) The professional skills and quality of employees are not high in the process of Construction Engineering: the quality of front-line construction personnel plays a decisive factor in the quality of engineering construction, which greatly affects the quality and progress of the project. This is mainly because most of them are composed of migrant workers, with poor quality awareness and lack of due quality knowledge [3-4]. At the same time, most of the management and technical personnel of construction enterprises do not receive professional education, and their quality is uneven. They focus on the division of responsibilities, professional construction quality, surface quality, etc., while ignoring the system constraints, the overall construction quality and hidden quality of the project. The construction quality control process is shown in Figure 1.

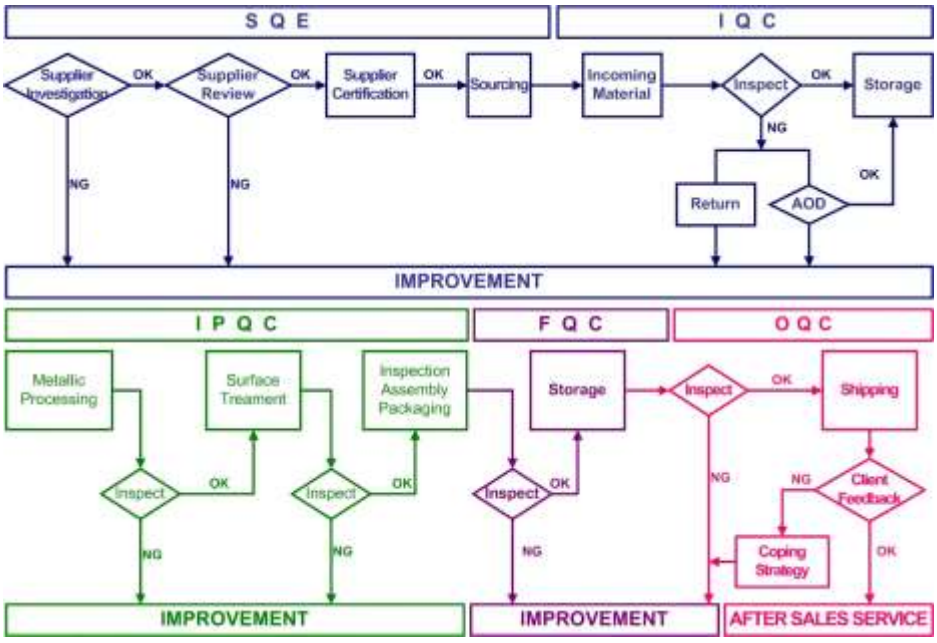

Fig. 1: The construction quality control process

(2) Construction materials are not standardized. Construction materials are the basis of construction quality assurance [5]. Only the quality of materials is qualified can the manufactured products meet the quality requirements. As the price of building materials keeps rising with the market, in order to obtain higher profits, the construction units often adopt the method of reducing the construction cost and choosing cheap inferior materials, which brings hidden dangers to the construction quality of the project, and the construction quality of the project often fails to meet the design requirements.

(3) The construction is not carried out according to the drawings or specifications. In the

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construction process of various projects, due to the differences in the understanding of the design drawings and specifications by the construction technicians and the neglect of the construction management process by the construction management personnel, they often carry out the construction and management according to their own experience, It makes the national quality standards and specifications in vain, and finally affects the construction quality of the project.

(4) Unpredictable quality of architectural engineering appearance the traditional construction process is completed under the guidance of the two-dimensional blueprint [6]. In the process of implementation, people often rely on their own experience and space imagination to control the construction, and do not have a good sense of the quality of the project to be completed. In the construction process, there are some misunderstandings about the design of some construction drawings, which often lead to some differences between the construction results and the design results, affect the perceptual quality and use quality of the project, and even cause the structural quality of the project.

(5) The construction process of construction project is a relatively complex process. In the construction process, there are often multiple professions, multiple types of work at the same time, and a variety of materials, a variety of mechanical equipment are applied at the same time, which will also lead to conflicts between professions, between types of work, and between equipment [7-9]. It affects the progress and quality of construction. These are mainly due to the difficulties in the coordination of the construction process.

Therefore, scientific and effective methods of Engineering Quality Supervision and control are needed. BIM Technology is such an effective method that can be applied in the construction quality supervision system.

II. ARCHITECTURE AND PROCESS OF BIM MANAGEMENT SYSTEM

BIM has eight characteristics: information completeness, information relevance, information consistency, visualization, coordination, simulation, optimization and graphing. So that the construction unit, design unit, construction unit, supervision unit and other project participants can share the same building information model on the same platform, which is conducive to the visualization and fine construction of the project.

For construction projects, the whole life cycle includes design, production, construction, operation and maintenance, as shown in Figure 2. In the management of the whole life cycle, information management is its important core content, that is, to establish an information model, to integrate the design, construction, operation and management, to avoid information errors in the process of communication and communication, to reduce the quality of management, and to affect the overall quality of construction projects [10]. In the whole life cycle management, the content of management mainly includes the following two aspects:

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(1) Realize information management and information engineering of construction engineering, improve project quality, construction efficiency and profitability;

(2) Manage all information generated during the construction of the construction project.

Fig 2: The Whole Life Cycle Information Management

The architecture of BIM management system, as shown in Figure 3, can be divided into:

(1) Model organization

In order to apply BIM to the whole life cycle management of prefabricated buildings, it is necessary to build the building information model first, and divide the model into different types according to the specialty. For example, taking the "component" of construction engineering as the basic unit, the relevant information of "component" is composed of "set", and the "container" in it is to store all "sets" in the same file. In BIM management system, the role of "file" is to connect different models together, improve the flexibility of model assembly, provide convenience for the management of the whole life cycle, and it is also the basis of realizing the goal of the whole life cycle management.

(2) Directory structure

Based on the splitting of building information model, dozens or even hundreds of different but closely related model files will be generated in the system. In order to improve the efficiency of management, after building the information model, all the files should be compiled into a retrievable directory, which is easy to refer to when calling. When organizing the catalog, it should be determined according to the project scale and project type, but its basic principle is to organize it according to the splitting model. Since all links of construction engineering from design to construction are constantly changing, it is necessary to take this change into consideration, and divide the contents into different states, such as "archiving", "publishing", "information sharing" and "construction process". Only by implementing the above work ideas and methods can we provide accurate document catalogue in the completion and delivery stage.

(3) File naming

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Usually, institutions or enterprises have specific rules on file naming, which can refer to or refer to European and American standards, such as AEC standard, AIA standard, etc. However, in order to ensure that the owners can clearly and intuitively grasp the basic content of the document, a unified standard belonging to BIM management should be formulated to ensure the standardization and systematization of the file name.

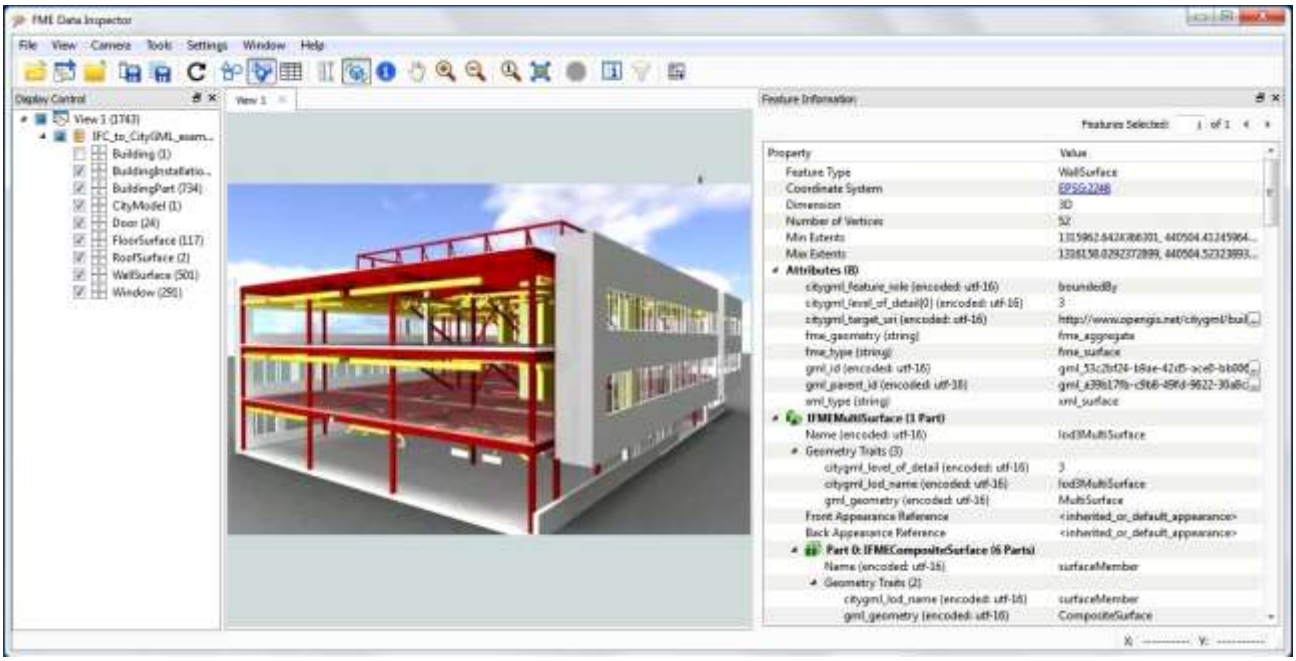

Fig 3: The Architecture of BIM Management System

(4) Collaborative approach

When applying BIM system to manage the whole life cycle of construction project, if the current project is large, the modeling should be established or divided according to the project scale, location and other conditions. Generally, there are two ways of system modeling: model linking and work sharing. Model link is an independent model. When the staff open the information model, they can only read but not change the internal file. The work sharing mode allows different staff to edit the file during the reading process. Compared with model linking and work sharing, work sharing is a more ideal collaborative work, but model linking is more stable and mature. Therefore, in the whole life cycle management of prefabricated buildings, the application scope of model linking is wider.

III. APPLICATION OF BIM TECHNOLOGY IN PDCA CYCLE

PDCA cycle is a basic method based on the quality system and quality management, formed through long-term production practice and theoretical research. The cycle method is applied in the construction process, which has a good control over the construction quality. Introducing BIM Technology into PDCA cycle of quality management method (as shown in Figure 4 below) can play a icing on the cake effect. The introduction here is not to change PDCA cycle method,

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but to improve the work efficiency of PDCA cycle, so that the construction quality of the project can be effectively guaranteed.

(1) Through the application of BIM Technology such as visualization, virtual construction and collision inspection, plan establishes the construction quality objectives and plans of the project. And determine the quality, schedule, cost and other plans, tasks and corresponding responsibilities of each participant in the project. At the same time, ensure that the logic between the project participants' respective plans is accurate and reasonable under the BIM environment, so as to form a complete project management and control plan.

Fig 4: PDCA Cycle

(2) Implementation (do) during the implementation of the project plan, BIM Technology is applied to formulate the construction scheme and construction technology, and strictly supervise the implementation of quality objectives and quality plans. The application of BIM Technology, such as visualization and virtual construction, can make the construction personnel and management personnel better understand the content of the construction scheme, more clear the intention and requirements of the plan, which is conducive to the deployment, disclosure and implementation of the construction scheme in the implementation process, and is conducive to the specific content of the quality plan to the resource allocation and technical activities.

(3) Check the application of BIM Technology to predict the implementation of the construction plan, and compare with the actual situation of the current construction, to determine the feasibility of the original plan. Find out the deviation in the construction and adjust it in time, so as to make the next stage plan smoothly. In the process of inspection, BIM Technology is used to collect quality information, which is convenient for subsequent statistics, analysis and recording.

(4) The application of action BIM Technology in the disposal stage of construction quality management is mainly reflected in taking preventive measures before problems occur, reporting the quality information of current project construction to relevant departments, and improving

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the objectives and measures together with relevant personnel; The existing problems are analyzed, and the corresponding improvement countermeasures are put forward. BIM Technology is applied to mark and describe the possible or existing problems in the model, put forward processing methods, and form work experience, so as to serve the later work. BIM Technology can be applied to the PDCA cycle process of construction quality control to improve the quality of the cycle, and PDCA cycle method can also promote the role of BIM Technology in specific engineering projects, enhance the application results and processes of BIM Technology in the quality control of construction process, and improve the benefits of BIM, such as: the curtain wall construction process of a project, before the construction, BIM Technology is applied for deepening design, virtual construction, and construction scheme formulation. PDCA cycle method is added in the process of construction scheme formulation, and the optimal construction scheme of curtain wall engineering is formulated in combination with PDCA cycle process. The specific process is shown in Figure 5 below.

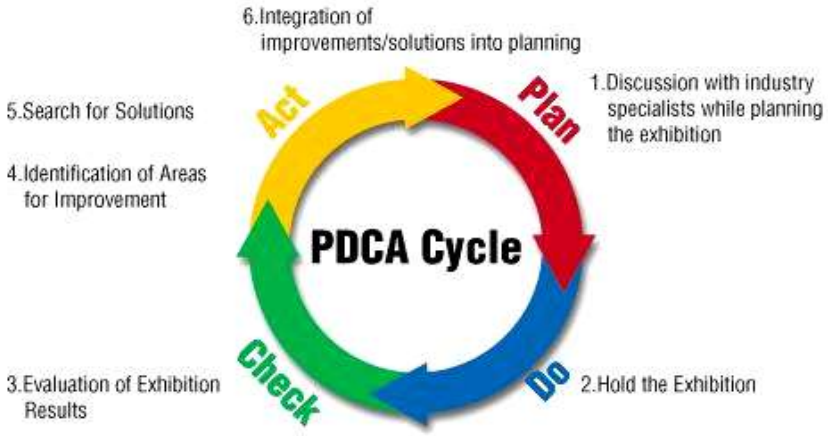

Fig 5: The specific process of PDCA and BIM

IV. CONCLUSION

In this paper, BIM Technology is introduced into the quality management method "PDCA" cycle, which can greatly improve the quality effect of the cycle and ensure the quality of engineering construction. At the same time, PDCA cycle method can also promote the specific application of BIM Technology in specific projects, enhance the application process or construction design process of BIM Technology, and improve the application efficiency and value of BIM Technology. In this paper, BIM and its related technologies are applied to the whole process of construction quality control, and BIM Technology is applied to the whole process of construction quality control. In this paper, BIM Technology is applied to the control before, during and after the construction process. This not only optimizes the building information model, but also strengthens and enriches the collection and management of

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engineering quality information in the construction process. This enables each stage of the construction process to be continuously followed up and recorded, and can be simulated, predicted and controlled in advance before the construction of each stage. After completion, the quality information is analyzed, shared and archived to improve the level of construction quality control.

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