Study on Construction Management Quality of Assembled Building Project

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Abstract

Based on the analysis of the quality management of the assembled building project, this paper introduces the design concept, geographical location, geological landform, and climate conditions of a certain assembled building and analyzes the control points and general requirements of the quality management of this project. On this basis, the project management system is established, and the management network system is compiled from three aspects: personnel management, system management and technical process management. According to this system, the content of quality management in each stage is determined.

Keywords

Building construction, Project management, Construction quality, Architectural design

Introduction

With the continuous acceleration of the overall development of China's construction industry, the processing methods of components in the construction process of buildings have also shown diversified development, and the applied technologies have become increasingly advanced. With its own advantages, such as shortening the construction period, reducing the cost, saving energy, and protecting the environment, etc., the application scope of prefabricated buildings has been expanding recently, and it has been increasingly respected by construction units [1]. However, the development of prefabricated buildings in China started late, so it is very necessary to study the project management of prefabricated buildings. The construction industry is in a rapid development stage in China, and it is also one of the important basic industries in China, and its development will affect the pace of China's economic development [2]. Judging from the actual situation in recent years, the speed of urban construction is accelerating, which puts forward new requirements for construction quality and speed. However, prefabricated buildings can just meet this demand. The construction industry just takes this opportunity to realize the transformation of industrialized buildings and solve the problem of slow development of prefabricated buildings in China [3].

The concept classification and characteristics of prefabricated buildings

The structural system of prefabricated buildings includes structural beams, floors, structural columns, shear walls, supports and other structural components that bear or transmit loads. The external protection system includes building external walls, roofs, external doors, and windows, etc. It is used to separate the internal and external environment of the building. Equipment and pipeline system include heating, ventilation and air conditioning equipment and pipeline system, gas equipment and pipeline system, drainage equipment and pipeline system, electrical and intelligent equipment, and pipeline system, which are used to meet the basic use functions of buildings. Interior decoration system includes floor surface decoration, interior wall decoration, light partition, ceiling decoration, interior doors, and windows, etc., which are used to meet the comfort requirements of building use [4].

Prefabricated buildings can be divided into block buildings, plate buildings, box buildings, skeleton plate buildings, and rising slab and story buildings according to different structural forms and construction techniques. According to the degree of assembly, it can be divided into semi-assembled buildings and fully assembled

buildings. According to the materials used in construction, it is divided into assembled concrete structure system, assembled steel structure system, and assembled wood structure system. Among these, the assembled concrete structure system is further divided into shear wall structure, frame shear wall structure, and frame structure. The respective relationships between these structures are also defined [5].

Assembled building is the main form, product, and carrier of architectural modernization, which has six characteristics: assembly, Informa ionization, standardization, intelligence, industrialization, and integration. Prefabricated buildings also have the following advantages different from traditional buildings.

First, prefabricated components are mass-produced in the factory in advance and then transported to the construction site for hoisting and splicing, which greatly reduces the intensity of on-site construction, even omits the procedures of masonry and plastering, simplifies the whole construction process, shortens the construction period and improves the construction speed.

Secondly, the on-site operations of prefabricated buildings include the hoisting and splicing of prefabricated components, and the construction of cast-in-place concrete is reduced, and the number of construction personnel can be small. At the same time, it will not produce a lot of construction waste like traditional construction, thus making the construction more environmentally friendly. Due to the standardized production of components, the utilization rate of materials has also been improved. In the construction process, the composite slab is used as the bottom formwork of floor and the external slab is used as one side formwork of the shear wall, so many templates are saved, and the consumption of building materials is reduced [6-8].

Thirdly, from the design link, it shows the standardization of design and the informatization of management. The higher the design standard, the higher the production efficiency and the lower the corresponding cost. If we cooperate with the factory informatization management mode, the overall cost performance of prefabricated buildings will be improved, and at the same time, it can meet the needs of green buildings.

Finally, prefabricated building components are processed in the factory assembly line, and the size can be closer to the design parameters, which can effectively improve some common quality problems.

Quality management of prefabricated building projects

Overview of project quality management content

Management is the process of effectively planning, organizing, leading, and controlling the resources owned by an organization in a specific environment to achieve the established organizational goals. Project management refers to the process of using specialized knowledge, skills, tools, and methods in project activities to enable the project to achieve or exceed the set needs and expectations under the limited resources.

The project management of construction projects is different because the construction project has the characteristics of one-time molding and non-repetition, which makes the construction project management must be a complete system and need to cover the whole project life cycle. Project management includes project scope management, project time management, project cost management, project quality management, project human resource management, project communication management, project risk management, project procurement management, project integration management and project stakeholder management.

Quality management in the early stage of engineering design

The preliminary construction drawing design is the initial link in the whole construction project, and the cost and quality of the final project depend on the quality of the design. The principle of design is to give priority to the use function of the building, and then to ensure that the waterproof system and thermal insulation system of the building meet the standards required by the code. In structural design, the emphasis is on the safety performance of the whole structure, and in addition, safety performance and durability should be considered when connecting key structural nodes. However, how to scientifically divide all parts into parts in the whole building frame and how to reassemble all parts into a whole on the spot of prefabricated components needs to be fully considered in the design stage. Design is a process from whole modeling to breaking into multiple small units, from whole to individual. Compared with the

traditional cast-in-place concrete building, the traditional building design foundation is mature, and designers can comprehensively consider the quality problems and cost problems in the later period based on years of design experience and can improve the engineering quality according to the actual situation [9,10].

Quality management of prefabricated components in production and processing stage

The quality of prefabricated components is related to the stability of the whole building, which affects the whole body. To ensure that the produced components meet the design requirements, it is necessary to check and record the raw materials of prefabricated components one by one before processing, such as whether the steel bars, cement, sand, etc. meet the design requirements. The mold for processing prefabricated components should ensure good mechanical properties, rigidity, and accuracy of the mold. The size of steel skeleton should be accurate, and the on-site forming mold should be used. To ensure the protective layer size of PC components is in place, special brackets should be used. Prefabricated wallboards often have embedded parts, and connectors and wire retention hole parts need to be accurately positioned on prefabricated parts. Certain special components require particular attention during prefabrication. Components with small sizes or cross-sections, for example, necessitate the use of smaller vibration equipment to avoid over-vibration or damage. For sections that undergo shape verification or complex formwork, it is necessary to appropriately extend the vibration duration to ensure the uniform distribution of concrete. This careful handling ensures that the resulting concrete elements are denser, have fewer voids, and achieve greater structural integrity once cured.

Quality management of prefabricated components in transportation stage

The transportation of prefabricated components can be divided into two stages: transportation from the factory to the construction site and transportation within the construction site, with distinct schemes applied to each. Within the construction site, components are usually hoisted directly to the required position by lifting equipment, whereas long-distance transportation from the factory to the site requires more detailed planning. In this case, transportation schemes and fixation measures must be formulated in advance to ensure that the prefabricated parts remain intact and undamaged during the journey. Key factors that need to be considered include whether the support system possesses sufficient performance to meet transportation requirements, the constraints imposed by the height and width limitations of the transportation route, and the use of protective measures - such as placing sleepers or other soft materials - at the contact points between components and supports to prevent local damage.

Quality management of precast components in hoisting and connecting stages

The construction process of the assembled building site includes hoisting, splicing, grouting and partially concrete pouring of components. First, the hoisting machinery should match the size, shape, weight, and installation height of prefabricated components, so that the components can be hoisted smoothly. In the process of hoisting, it should be raised steadily to prevent swinging from side to side, and avoid bumping corners, falling wire ropes, cracking or even breaking of laminated plates, and falling of embedded parts. Moreover, in the face of such heavy items as concrete members, it is exceedingly difficult to hoist, which requires professional special operations personnel to operate skillfully. The hoisting scheme, hoisting position and hoisting sequence will affect the construction period, construction quality and even construction cost of the whole project to a certain extent.

Secondly, in the process of installation and connection of prefabricated components, it is easy to have problems such as difficult positioning of components, deviation exceeding the allowable value, and large assembly error of wallboard. Therefore, in the process of construction management, the accuracy of prefabricated components assembly should be strictly controlled to reduce the errors generated in the installation process. Once again, after the prefabricated components are installed in place, the horizontal and vertical accuracy of the components should be adjusted first to ensure the smoothness of the appearance of the assembled components. Finally, the gap between prefabricated components needs to be grouted and compacted, which is a particularly crucial step and needs continuous review. Whether grouting is filled in place is related to the use of the whole building in the later period.

Assembled construction project quality management methods

Total quality management

The concept of total quality management was first put forward by an American scholar, Feigenbaum. It is a modern management concept to meet the diversified needs of modern management. China has also put forward the management idea of "two participation, one reform and three combinations". Total quality management includes complete process management, total quality management and total staff management. Whole-process management refers to management at every stage in every process that affects product quality. For prefabricated building projects, it starts with the overall planning of the building, and goes through comprehensive management at various stages, such as preliminary design, construction drawing design, secondary deepening design of components, mass production of components in the factory, overall transportation and storage, on-site assembly, and final acceptance. Total quality management refers to not only the management of finished products, but also the management of the work quality of staff in various departments related to product quality, as well as product design quality, qualified rate of components, production cost and after-sales service. Total staff management refers to the management of each person directly or indirectly related to product quality.

SDCA quality management

SDCA cycle covers the whole production process and is divided into four management stages, namely:

S: refers to standards; to improve product quality, enterprises put forward a series of quality standards and prepare quality acceptance regulations. D: refers to implementation, which means that enterprises apply these quality standard systems to actual production activities. C: refers to inspection, that is, through the implementation of quality control standards, the products are inspected one by one according to quality evaluation standards, and the unqualified products are disposed accordingly. A: It means summing up, summarizing according to the problems detected, putting forward technical measures to improve quality standards, and whether to strengthen the implementation of quality standards.

The standardization of SDCA cycle quality management control is of great practical significance. It provides a solid technical reserve, ensuring that enterprise technology is not lost with personnel transfers. This process improves production efficiency, reduces costs, prevents the recurrence or variation of problems due to personnel changes, and provides valuable information for future personnel training.

PDCA quality management

PDCA cycle quality control is a further improvement and innovation of product quality control based on SDCA, which can improve product quality more effectively.

PDCA is embodied in complete process management, including scheme formulation, cost control, production process control, project management and other stages.

Like SDCA, it is also divided into four stages.

P: In the planning stage, according to the investigation and interview, we can understand the customer's quality requirements for products, determine the quality policy, quality objectives and specify the quality plan.

Including the investigation and analysis of the current situation, determining the main factors and specifying the plan. D: In the implementation stage, according to the objectives put forward in the previous stage, the products are designed and tested, and the personnel are trained before the implementation of the plan, and finally mass production is started. C: In the inspection stage, the whole process of product production is monitored, and the finished product is inspected to see whether it meets the previously specified product objectives. A: In the adjustment stage, according to the inspection results, analyze various influencing factors, put forward corresponding adjustment measures, integrate the successful experience into the standard plan, and transfer the products with problems to the next cycle for improvement.

Conclusion

Assembled buildings have the advantages of shortening the construction period, saving energy, being green and environmentally friendly, and are the inevitable trend of China's construction industry.

With the continuous development of information technology, the technical transformation of prefabricated buildings using advanced technologies, such as BIM, enables the integration of all professional systems.

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Conflicts of Interest

The authors declare no conflict of interest.

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