

The Common Quality Problems and Preventive Measures of Prefabricated Building Construction

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Abstract: Prefabricated building construction has strong environmental protection characteristics, and also shows high application advantages in terms of construction cost and construction efficiency, and has a good promotion effect on improving the construction technology level. However, in the process of prefabricated building construction, there are often some inevitable quality defects, which have a great impact on the overall quality of the construction project, not conducive to the scientific development of the construction industry. Therefore, it is necessary to take effective measures for the prefabricated assembly. The quality problems in building construction are prevented, so that the quality of building construction is effectively guaranteed. This paper analyzes the common quality problems in prefabricated building construction, and puts forward some specific measures according to the actual situation, hoping to provide an effective reference for the prevention of common quality problems in prefabricated building construction.

1. Introduction

The prefabricated building has the functions of high production speed, high efficiency, environmental protection and energy saving, and has gradually become a construction technology advocated by the state. However, the existing construction process is not mature enough, and the construction preparation and on-site management system are not sound enough [1]. Therefore, the construction company analyzes the safety, reliability and durability of the prefabricated building, and studies the problems existing in the construction of the prefabricated building, sums up the corresponding quality control measures, and provides guarantee for the long-term development of the prefabricated building.

2. The characteristics of prefabricated buildings

As a relatively new technology, the prefabricated building requires relatively high construction quality, construction personnel technical level, construction organization ability and drawing dismantling quality. This kind of structure and construction form has the following characteristics [1]:

1) Most of the components need to be prefabricated to replace the traditional cast-in-place structure with the planar work method using the stencil. This type of construction operation can well control the construction quality and construction progress.

2) Since most of the components of the structure are produced by the factory, advanced construction techniques and machinery can be utilized to ensure the quality of the products to a large extent, and the noise pollution on the construction site will be greatly reduced and improved. Production efficiency, greatly shortening the construction period, and avoiding dust and other pollutants on the construction site.

3) Since the prefabricated building structure is a relatively advanced engineering technology, the structural form of the building has a relatively high demand for the quality of the early design and the technical level of the construction workers in the later stage.

3. Advantages of prefabricated buildings

3.1 Diversified design.

At present, the residential design and housing requirements are seriously out of line, the load-bearing walls are large, the openings are small, the separation is dead, and the space of the room cannot be flexibly divided [2]. The prefabricated house adopts a large open space, and the user can flexibly use the combined wall to divide into a space environment of “whatever you want”.

3.2 Functional modernization.

Traditional building energy efficiency is low. The ground, roof, wall, door and window frame of the prefabricated building adopt various new insulation and heat insulation materials. The house adopts new heating and cooling technologies, such as solar energy storage and utilization; the factory building components have high precision [2]. It can improve the sealing function of walls and doors and windows.

3.3 Manufacturing factory.

Intelligent residential buildings should use green high-quality materials for both wall structural materials and interior decorative materials, and factory-based production is the optimal production method for residential modernization [2]. For example, it is very difficult for a traditional building to make its beautiful exterior coatings fade for a long time. However, the factory-produced building exterior wall panels are not only light and high-strength, but also the beautiful colors of the buildings can be faded for a long time in the factory through molds, mechanical spraying, baking and other processes.

3.4 Construction assembly.

Since the prefabricated building is about half the weight of the traditional building, the requirements for the foundation bearing capacity are also reduced, and the foundation construction is much simplified [3]. After the prefabricated building components of the factory are transported to the construction site, they can be installed and constructed according to the design requirements, as shown in Fig. 1.



Fig.1 Construction prefabrication

3.5 Time optimization.

The biggest advantage of prefabricated buildings is that they shorten the time of on-site construction and have higher predictability for the construction period. Projects in prefabricated buildings can save time from factory manufacturing and on-site construction. Prefabricated foundations are rarely used in construction projects, so the site processes the production of structures, structural components, and service systems and indoor integrated modules while building the foundation [3].

3.6 Technology is sustainable.

Although the use of integrated components has been put on the agenda of designers and technical experts during the construction process, the theory of fabricated construction does not intersect with the environmental protection theory system. Today, people are aware of the serious environmental damage caused by construction waste [3]. In the process of cutting and raw material mixing in processes such as wood processing, bricklaying, painting and decorating, there is no waste of waste due to the process of integrated assembly, which is a huge waste in the construction process.

4. Common quality problems in prefabricated building construction

4.1 Flat panel production and installation problems [4]

1) The corner plate is broken. The corner plate is an important construction for maintaining the stability of the overall structural frame of the fabricated building. Because the fabricated building has the characteristics of thin thickness, large volume and easy breakage at the corner, it is transported in the component. Corner slabs are often destroyed during the hoisting process. The main reason is that the inner fold of the corner plate is easy to be damaged during the hoisting process, and the improper maintenance during the construction process can easily change the angle of the corner.

2) The insulation layer of the outer wall panel is easy to break. Under normal circumstances, the insulation layer of the outer wall panel is prone to the problem of falling off and breaking. The main reason is that the exterior wall panel is often used for exterior decoration and insulation during the processing. The "sandwich" component composed of the layer and the structural layer cannot be unified by the three-layer material, which causes the outer wall panel of the heat insulating material to fall off or break.

3) Fracture of laminated plates. Cracks often occur during the transportation and lifting process of the laminated plates, and severe fractures may occur directly. In the production process, warpage, break angles and corners, truss ribs and pre-existing may also occur. The main reason for the problem of the detachment of the embedded parts is that the overall span of the laminated plates is too large. During the transportation process, the slabs are squeezed. The deflection in the hoisting project exceeds the upper limit of the slings, and cracks are generated. The cracks will quickly extend to the entire plate. And damage the components.

4.2 Prefabricated component connection problems

1) The grout is not full. Normally, during the process of pouring concrete, the slurry flows out from the cavity on the upper surface of the plate, indicating that the grouting is completed, but the inside of the pipe cannot be viewed, and the filling fullness cannot meet the relevant requirements [4]. In addition, improper process operation in the production process or incomplete grouting hole cleaning may also result in blockage of the grouting hole.

2) The sleeve connection is misaligned. When a complete offset occurs, the component needs to be reworked, and when a local offset occurs, the way the steel bar is inserted into the hole is changed.

3) Improper protection of finished products [5]. After the components are transported to the construction site, improper storage can easily cause accidental damage. The site management of the construction enterprise is not in place, the material storage environment is bad, and the influence of temperature, humidity and other factors will damage the finished product performance of the component.

4.3 Installation dimensional deviation problem.

The installation dimensional deviation problem is mainly manifested in the fact that the wall panel splicing joint treatment exceeds the specification requirements, the seam between the wall panel and the balcony panel is not smooth, the width and the width are uneven, and the height deviation of the kitchen and the bathroom lowering panel is inferior [5].

1) Personnel. Compared with the cast-in-place concrete structure with mature technology and rich experience in engineering practice, there are currently few assembly projects, less practical

experience of workers, and experience and operational skills of prefabricated components need to be accumulated and improved.

2) Material aspects. The unqualified quality of the components itself leads to the accumulation of installation errors, including the accumulation of component dimensional errors, the accumulation of component flatness errors, and the accumulation of component embedded component position errors.

3) Mechanical aspects. Lack of practical precision control tools, resulting in large wall panel seam error, uneven seam width, and a large gap with the goal of industrial buildings, while the component swaying when lifting components is not easy to control the installation accuracy.

5. Precautions against the quality problems of prefabricated building construction

5.1 Strengthen the use of auxiliary tools.

In the prefabricated building construction and installation, due to the large weight of most PC components, it brings great difficulty to the hoisting and installation of the project, so the use of auxiliary tools is strengthened. For example, use a corner plate "L-shaped" spreader. The corner plate is prone to bending and damage during transportation, management and hoisting [6]. In order to ensure the quality of the corner plate to the utmost extent, the "L-shaped" spreader is used in the hoisting process, and the tensile force of the corner plate is hoisted. Transfer to the "L-shaped" spreader to ensure the quality of the corner plate.

5.2 Reasonable control of component connection quality.

During the construction process, relevant personnel should appropriately increase the aperture, improve the hole penetration rate of the alignment bar, and enhance the integrity of the connection of the prefabricated members to effectively solve the prefabricated steel bars and the reserved holes in the field [6]. The problem of the alignment. In addition, in order to effectively solve the problem of insufficient filling of reserved holes, relevant personnel should strengthen the quality supervision of hole grouting and strengthen the operation skills of the operators. The supervision unit supervises and inspects the grouting quality by 100% inspection to ensure the quality of grouting.

5.3 Establish a sound assembly quality supervision mechanism.

Many problems at the construction site are not caused by the construction personnel, but the assembly engineering design or the prefabricated components have problems in the production and processing, which has led to a series of construction quality problems. Through the establishment of a scientific and perfect quality supervision mechanism, through the comprehensive and full-process supervision and inspection, the problems that may exist in the construction process are controlled in the germination, thereby reducing the problems encountered in the construction process and improving the construction efficiency, so as to be more comprehensive [7]. Strengthen the supervision work of prefabricated building construction. Standardize engineering supervision in the aspects of construction plan review, construction production supervision, component factory entrance inspection, model house witness, grouting waterproofing and other key links, installation risk point protection supervision and structural engineering acceptance [6].

5.4 BIM-based component design and construction.

In the design and construction of prefabricated buildings, accurate three-dimensional modeling is carried out through the application of BIM technology to solve the collision between structural members, embedded pipelines and staggered steel bars, guiding the production, construction and installation of prefabricated components and engineering [7], as shown in Fig. 2.

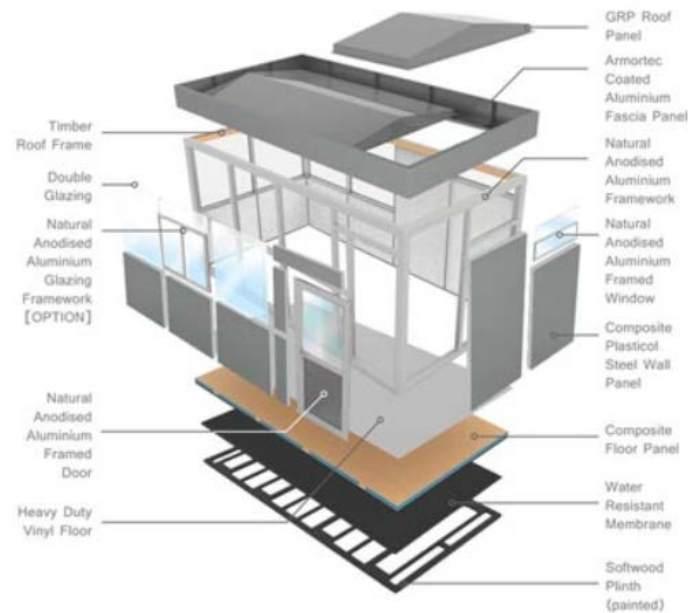


Fig.2 Application of BIM technology in prefabricated building design

5.5 Strengthen the training of construction personnel.

Inviting assembled construction engineering research professionals to carry out relevant construction technical training for construction management personnel and construction personnel to standardize the construction process and construction process, or dispatch personnel to the advanced construction units of assembly and construction technology at home and abroad to learn and advanced the construction design and construction process are applied during the construction process, so as to improve the construction efficiency and ensure the quality of the assembled construction project [7].

6. Summary

In summary, the prefabricated building is a form of construction and construction with many advantages, featuring high construction efficiency, short production cycle, saving building materials, reducing labor costs, better construction quality, and safer construction workers. However, many problems will arise in the process of prefabricated building construction, which will affect the quality of building construction. However, through continuous learning and improvement of building technicians, the rationality of prefabricated building construction can be effectively improved and the healthy development of the construction industry can be promoted.

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