

Thoughts and Opinions on the Safety of Prefabricated Buildings

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Abstract: In order to save resources, protect the environment and improve the level of construction, assembly building has become a way to reform the construction mode in China. However, assembly building started late in China, and there are few studies on the safety of assembly building. Therefore, it is particularly important to scientifically and reasonably understand and evaluate the safety problems of assembled buildings, and then formulate corresponding pre-control countermeasures. This paper puts forward the development status and existing problems of assembly building, and puts forward corresponding countermeasures and suggestions.

1. Introduction

As a new type of green building production mode, assembly building meets the inherent requirements of sustainable development and has been vigorously promoted in recent years. The executive meeting of the State Council also clearly pointed out that we should comprehensively promote the structural reform of the supply side and the development of new urbanization, vigorously develop assembly buildings, and promote the adjustment and upgrading of the construction industry structure. Assembled building started late in China, and there are few studies on the safety of assembly building construction. Compared with traditional construction methods, the main influencing factors of construction safety of assembled buildings introduce many new technologies and technologies. Therefore, the selection of influencing factors of construction safety should not only include the similarities between cast-in-place constructions, but also pay attention to the differences between them. Therefore, relying on scientific and reasonable models to evaluate the construction safety of assembly buildings, and then formulating corresponding pre-control countermeasures is particularly important.

2. Development course of assembled architecture in china

In order to promote the modernization of China's housing industry, relevant policies and standards have been issued from the state to the local government. By the end of 2017, most provinces and municipalities in the country have clearly defined the functional institutions to promote the development of assembly buildings. By April 2018, 16 pilot cities and 65 base enterprises have been

approved in China. Driven by these pilot projects and demonstrations, more than 30 provincial or municipal governments have issued development goals for assembly buildings.

2.1 The establishment of technical support system

At present, China has gradually formed an assembly building system with Chinese characteristics. In the aspect of building structure, PC structure system and steel structure residential system have been developed and applied to a certain extent. The construction technology of assembly shear wall, frame hanging plate and other structural systems is becoming more and more mature. The technology of heat preservation and energy saving has been applied in design, and the proportion of integration of construction and decoration has increased. In the key technology, the sleeve grouting technology and the restrained grouting anchor lapping technology have been formed. In general, the prefabricated building structure system, parts system and technical support system were initially established, which provided certain technical support for the further development of the prefabricated building.

2.2 The supply and demand of prefabricated building

At present, the distribution of PC manufacturers in China is extremely unbalanced, mainly concentrated in the east, represented by Beijing, Shanghai, Jiangsu and other places, while there are relatively few PC manufacturers in the central and Western regions. In 2017, 70 new PC factories and 90 production lines were added nationwide, mainly in the residential component market. In some areas, the production capacity has been seriously excessive.

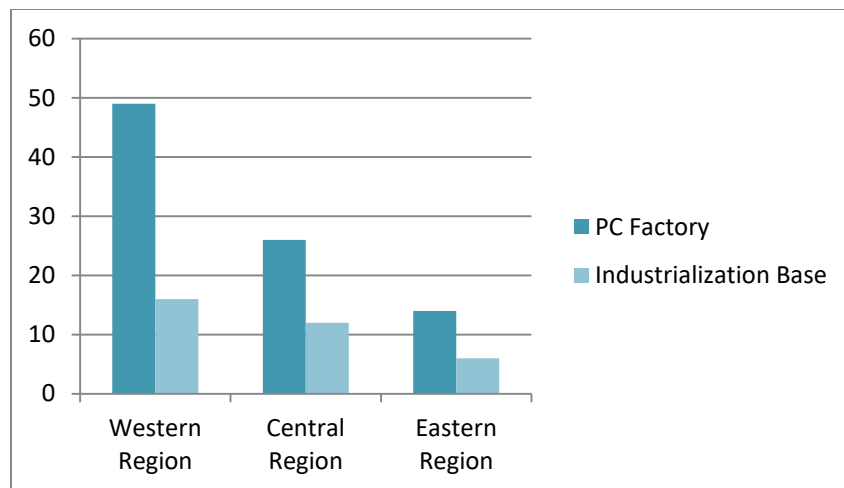


Fig1. Distribution of PC factories and industrial bases

At present, the distribution of PC manufacturers in China is extremely unbalanced, mainly concentrated in the east, with Beijing, Shanghai, Jiangsu and other places as the representative, the central and western regions of the construction PC manufacturers are relatively few, almost No. In 2017, 55-65 PC factories were added nationwide, with about 80 production lines, mainly concentrated in the residential component market. In some areas, production capacity has been seriously surplus. As showed in the following figure 1.

3. Current problems in the development of prefabricated buildings

Assembled architecture is a transformation of traditional architecture in China. It integrates many innovative elements through scientific and technological transformation on the basis of inheriting traditional architecture, but it also brings some problems.

3.1 Fabricated buildings' integrity is worse than cast-in-place concrete buildings

The transformation of concrete from liquid to solid is irreversible. Solid concrete cannot melt into liquid at high temperature like steel, and prefabricated concrete members cannot be welded into one as steel members. In order to ensure the integrity and safety of concrete building structure, concrete pouring in construction site can really play its unique advantages, which is incomparable with other materials. However, the integrity and safety of prefabricated concrete structures formed by connecting prefabricated concrete members through technical measures are inferior to those of cast-in-situ concrete structures, both in theory and in practice.

3.2 Insufficient depth of BIM application

At present, the application of BIM in assembly building is mainly focused on the problems of pipeline collision prevention, process conflict, steel bar fighting and inclined support arrangement in the construction process. It is still in a relatively primary application. It has not given full play to the real advantages of BIM. It is necessary to strengthen the application of BIM technology in the whole life cycle of assembly building. It is necessary to establish a management model of assembly building engineering suitable for BIM technology application, promote the integrated application of BIM technology in the whole process of assembly building planning, survey, design, production, construction, decoration, operation and maintenance, and realize the data sharing and information management of the whole life cycle of construction projects.

3.3 Poor production quality of prefabricated components

At present, the production quality of prefabricated components needs to be improved, such as inadequate reserved pipelines, deviations in component size that do not meet the specifications, inadequate deepening design, which leads to inadequate construction requirements, large deviation in reinforcement position, and inadequate roughness. The root cause of the above problems lies in the inadequate collaboration among enterprises in the industrial chain. Therefore, the application of BIM life cycle and the implementation of EPC project general contracting management model can solve the problems of component production stage very well. Secondly, the low professional literacy of workers in component factories leads to the urgent need to strengthen the technical training of assembly construction operations.

4. Development countermeasures for prefabricated buildings

4.1 Giving full play to the natural advantages of fabricated steel structures

The steel structure has high strength, light weight and is suitable for industrial production. It can melt into one after assembly and welding in the engineering site. It maintains the integrity of the

structure and has good seismic performance. It can meet the needs of various building heights and various building planes. It can be used in conjunction with non-load-bearing light wall materials. Its construction and installation are highly industrialized, and conforms to the principles of environmental protection and sustainable development.

4.2 Jointly implementing prefabricated and cast-in-place construction

In the long period of construction development, we should adopt a series of common development policies, such as the combination of prefabrication and cast-in-place, the combination of dry and necessary wet operations, the combination of new materials and traditional materials, the combination of factory production and field prefabrication, so as to give full play to the advantages of cast-in-situ concrete.

4.3 Realizing the modernization of architecture

Adhering to the principle of modulus coordination, promoting standardized design, establishing a standard system for general structural components and functional components, adhering to technological innovation, adopting new technologies and new materials, and researching and developing advanced and applicable component connection technologies to ensure the quality of commercial concrete and prefabricated components, and improve the structural safety and use function of concrete buildings. In addition, According to local conditions and gradual progress, the mechanized construction and information management of the foundation, structure and decoration of the building will be fully realized.

5. Conclusions

It should not blindly promote the assembly concrete building. Choosing prefabricated or cast-in-place, or combining prefabricated with cast-in-place, should proceed from reality and be determined according to engineering conditions and market needs. The requirement of building seismic resistance is high. For a large number of high-rise concrete structures, cast-in-place concrete should be the main method to ensure the integrity and seismic safety of concrete structures.

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