Present Situation and Problems Analysis of Waterproof and Seal of Prefabricated Building Exterior Wall

Qizhi Zhang

Huanghuai University, Zhumadian, Henan, 463000, China

Abstract: With the continuous development and progress of China's social economy, the construction speed of our construction industry is also accelerating. Compared with the traditional cast-in-place reinforced concrete and masonry building, it has been unable to meet the requirements of the construction industry and the development of the times. Because the prefabricated building has the advantages of fast speed, water saving, land saving, noise reduction, material saving and energy saving in installation. Compared with traditional buildings, the prefabricated building is more energy efficient and practical. Therefore, the new type of precast assembly architecture is constantly highlighted and has become the mainstream of the development of the future construction industry. However, the technology started late in China, and the immature technology and imperfect supporting standards led to slow progress and even stagnation in China's construction industry. Through the analysis of the present situation and problems of the waterproof and sealing of the prefabricated building exterior walls, the suggestions for the healthy development of the construction industry in China are put forward in time.

Keywords: Prefabricated housing; Waterproofing on the exterior wall; Seal; Problem

Corresponding Author: Qizhi Zhang, 13939676800@163.com.cn

1. Introduction

Since the founding of the people's Republic of China, China's construction industry has developed rapidly, and high buildings have risen to the ground. With the continuous accumulation of experience in the construction process and the continuous innovation of construction technology, many problems will be produced in the traditional way of building. For example, increasing labor force and prolonging the construction period; adopting the traditional on-site casting method can not effectively guarantee the quality of construction, and will also cause great impact on the environment.[1] Noise pollution and construction waste pollution happen all the time. In the construction process, in order to reduce the formation of construction joints, will be working all night, affecting the normal rest of the surrounding residents; the construction site work in the open air, for the weather, will reduce the construction personnel's working efficiency, and even safety problems. As a result of the traditional architecture, there are all these problems. Subsequently, the technology of prefabricated building was developed. Many developed countries began to emphasize the promotion of prefabricated building in the late 1940s. However, 60 years ago, China began to explore prefabricated building. Precast technology has been widely used in various types of construction, but due to the current technology is not mature enough, the lack of supporting standards and other issues, in the process of building use will produce some problems, which led to China's construction of industrialization process is slow, even stagnant. Therefore, in order to improve the prefabricated assembly technolo-

gy, the current situation and existing problems of waterproofing and sealing of such buildings are deeply analyzed and explored.[2-3]

2. Discussion on the Difficulty of Waterproof Weight of Prefabricated Building

The degree of building waterproof directly affects whether the building function can be completely realized. The gaps between traditional building windows, brick walls, kitchen and toilet are easy to leak. In order to ensure the waterproof function in the assembly building, the assembly component should be adopted in the construction process, and the joint casting process is added at the same time. Prefabricated construction bay window is not prone to leakage, because when the workshop production line, have been assembled and assembled; building external wall is prone to seam leakage situation, mainly is the emergence of a large number of stitching seam caused in the construction process. At the same time, the repair difficulty of the composite thermal insulation exterior wall is increased. To some extent, the assembly building has increased the difficulty of leakage. Therefore, the sealing and waterproofing of the assembled exterior wall joint is the key of the assembly building waterproof.[4]

3. Waterproof and Sealing Methods of Two and PC Outer Wall Joints

1) PC outer wall joints not only have horizontal joints, but also vertical seams. The commonly used waterproof seals have two kinds of waterproofing and material waterproof. The cavity is important in the back surface of waterproof joints, forming a cavity, first of all to the sealing strip or cast-in-place concrete, should be properly selected according to the frame structure, different functions, thus forming the two seal, two sealing cavity can be formed between the so-called waterproof waterproof material; for it is in the cavity of waterproof on the contrary, mainly in the joints of the water face, through the upper and lower panels reserved position to form the level of joint and the groove, on the filling materials, filling materials belong to seal material.[5]

2) Cavity waterproof. To achieve the purpose of waterproofing, we need to set up a more reasonable and proper linear structure on the side of the outer wall board, such as drip lines, rapids and water retaining platforms, so as to form a pressure balanced cavity. Has a very important significance to the pressure balance cavity, once the water flows into the cavity, there will not be a problem, because the particularity of the medial and lateral cavity, high low, drainage channel flow will follow the cavity has been set up, directly into the joint vertical cavity, the cavity drainage through it in the most low-end tube exhausted, you can play the waterproof effect. The drainage pipe is arranged in the vertical cavity bottom, so that not only can the inflow of water in the cavity, from the inside out; meet the effect of wind, also can ensure the air pressure inside and outside the cavity will not change, still the same pressure, water vapor will not be because of the action of the wind, into the cavity. But if they block the internal precast wall precision and cavity, resulting in cavity not waterproof, but also rely on the cavity is completely waterproof, waterproof function can not be achieved prefabricated construction, in this case, the rubber sealing strip or cast-in-place concrete can have a certain role.[6]

Table 1. Comparison of the advantages and disadvantages of common building glue

Project	Classification of Sealant			
	SR	SR	SR	SR
Resistance to displacement	Fair	Fair	Fair	Fair
Bonding capacity	Fair	Fair	Good	Good
Weather resistance	Good	General	Fair	Good
Resistance to pollution	Poor	Fair	Fair	Fair

Sealant and PC exterior wall board are closely related, so the sealant must meet the following characteristics according to the features of the application parts of the PC exterior wall plate.

First, it has good resistance to displacement and creep. In the process of implementation of existing prefabricated components, because there will be expansion and contraction effect, joint size will be affected to a certain extent, he will be cycle changes; for some building walls, which is non structural prefabricated external walls, in order not to affect the impact of the earthquake force, can withstand certain resistance in the design of a rigid requirements of the requirements of the plan, to precast wall panels, in a certain range of activities so only achieve anti displacement ability and sealing good creep properties, in the process of using PC wall panels can be performed safely.

Second, it has excellent cohesiveness and compatibility. The PC exterior wall itself belongs to the concrete prefabricated structure, which is a porous

material. The bonding effect of sealants is influenced by many factors. The size and distribution of holes and the condition of concrete will directly affect the bonding effect of sealants. The hole size and uneven distribution are not conducive to the sealant is good bond; the concrete characteristics, which itself is alkaline, some alkaline substances in migration to the bonding process, it will directly affect the bonding effect of sealant; the key is in the production process of precast wall panels, demoulding agent be sure to use, in many degree on the bond performance of sealant will also play a certain impediment. Therefore, in the production process, the matching sealant and the concrete base material must have good compatibility and bond.[7]

Third, it has good weatherability. In the process of production, the selection of sealing materials is very important. The selection of sealing materials directly affects the life and safety of PC building. The sealant and concrete should not only be compatible, but also have the properties of low temperature flexibility, mildew resistance and water resistance to a certain extent. It is necessary to choose the sealant with weatherability as waterproof material in order to achieve the due effect.

Fourth, it has good pollution resistance. Because of its small molecular material sealant contains a certain amount of, and did not participate in the reaction, and the executive service time is also increasing, so no small molecules involved in the reaction, and gradually penetrate into the concrete free; in some cases will produce static, the surrounding concrete slab on the will some part of the dust stuck phenomenon, which will produce black, and with the shape of the pollution, has certain effect on the exterior surface of the building is beautiful.

4. Implement Prefabricated Building by Using BIM Technology

According to the present situation, is still in the form of expression of the 2D drawing design work now for prefabricated buildings, buried in the operation process of connection node location and pipeline pre-need an accurate expression, while the traditional two-dimensional expression was unable to accurately express the content, cause communication difficulties to a certain extent. This requires us to express it in a new way, using three-dimensional expression, BIM technology can solve these problems in a timely manner, and solve problems with design and practice with all professions.

1) Structure professional synergy.

The shape, plane and structure of prefabricated building have some influence on the design of aseismic. Therefore, in order to meet the requirements and requirements of aseismatic design, it will be strict. In order to meet the requirements of industrialization, precast building components must be strictly designed, not only to meet the principle of reasonable force and connectivity, but also to be more convenient in construction. In order to process and transport, the size and weight of precast construction is the most critical. Reasonable size and weight should be established, which is conducive to improving the quality of the project and promoting the reasonable control of the construction cost. Besides, bearing walls and columns should also pay attention to whether the upper and lower cases are continuous, and the openings of doors and windows should also be aligned. And the doors and windows in the opening of the hole, also to meet the two reasonable requirements, that is, structural force and prefabricated components.

2) Water supply and drainage professional coordination.

Prefabricated buildings need the public space of the hole size and location of vertical wells in vertical lines will be reasonable to consider the relative concentration of the state, and to reduce the level of pipeline crossing. The contents of the reserved holes and the pre buried casing are different. The reservation hole is to pass through the prefabricated floor, and the pre buried casing passes through the pipe of the precast beam. But we must pay attention to the internal tube and ceiling pipeline status in the implementation process, to overhaul and replacement, convenient operation. The way of the same layer drainage can be used in the housing set, but the waterproof structure must be paid much attention. In the installation of bathroom and kitchen, the location and size of the pipe interface must be a good material with the manufacturer.

3) Cooperation of HVAC.

The indoor heating pipelines is arranged in the form of independent loop, the main vertical pipe heating system should not only be arranged in a public space, household control valve is also arranged in the public space of the vertical tube well, in order to facilitate future maintenance and management, in the heating, the surface radiation of low temperature hot water, and the water collector is divided to construct the ground cushion combination of relative rationalization layout. In the use of radiator heating, the distribution of the distribution of the radiator and

the direction of the pipeline must be rationalized. For the split type air conditioner, the bedroom and the living room should meet two conditions, first of all, the position of the air conditioning installation, which is in fact a pre-buried position. For the centralized fresh air system, the determination of all positions is very critical. We must pre-determine the layout of the air duct, the layout of the kitchen and toilet exhaust passage in the residence.

4) Coordination of electrical telecommunications.

When arranging the location of household distribution box, we should pay much attention to the dark mounted electrical equipment. We must ensure that the electrical equipment on both sides of the household wall is not connected. Prefabricated components not only need to consider the requirements of the internal assembly, but the locations of sockets, lamps and large interfaces have been determined. It is also necessary to consider the layout of the line and the building components in a comprehensive way. At the same time, the line pipe can play a protective role when laying the precast wall or the laminated plate in the dark. In order to install electrical switches, sockets, connecting pipes and other contents, we must make effective and reasonable present embedment in the corresponding position of precast wall. In addition, pipeline equipment is not what place can be buried on the interior wall and the exterior panels, lintels and anchorage zone etc. this area can not set the equipment pipeline.[8-9]

5. The Problems in the Research on the Waterproof of the Prefabricated Building Wall

Compared with traditional cast-in-place building, prefabricated building has no difference in design theory, but there are great differences in construction ideas. The prefabricated building can meet the requirements of the design to a certain extent. However, due to some other factors, there will be some problems in the practice of exterior wall waterproof.

1) The sealants commonly used in buildings are mainly SR sealants, PU sealants, MS sealants or SPU sealants. Sealants have different materials, so their performance indexes are different. However, due to the lack of current supporting standards and constraints, in practical engineering, there are many phenomena of sealants used when sealant is used in PC outer wall joints. It can be briefly summarized by two words of non confusion.

2) Nowadays, the research of PC building exterior wall waterproofing mainly focuses on design and construction. So we neglect the study of matching sealing materials, and have no corresponding research and Analysis on its durability, late maintenance and replacement. Through the durability index as an example, analysis of the problem, according to China's construction industry situation, for reference many conventional products, need analysis and evaluation standard, to a certain extent, not only the lack of PC wall plate features durability test, lack of artificial aging test method.

3) Sealant has different properties because of its own materials. Therefore, the size, depth and bonding properties of sealants will have a direct impact on the waterproof function of PC building. However, for the detection of PC sealant wall construction quality field, detection techniques, lack of professional technology, lead to the detection and on-site inspection of prefabricated building external wall waterproofing work, the use of human observation and measurement of the stage, its the inevitable uncertainty set.

References

[1] Fenghe Mi, Dawang Geng. Prefabricated construction technology[J]. Waterproof Construction Engineering Technology and Design, 2016(21):2994. (in Chinese)

[2] Shengli Lv. Research on waterproof technology of exterior wall of precast assembled concrete building[J]. Fujian Construction Technology, 2017(3):69-73. (in Chinese)

[3] Tao Ling. Assembly type construction waterproof and sealing technology[J]. Chinese Architectural Waterproof, 2016(5): 30-33,41. (in Chinese)

[4] Mingli Zhu. Assembly type building waterproof seal technology[J]. Urban Construction Theory Study (Electronic Edition), 2016(16). (in Chinese)

[5] Tianliang Li. Quality control of construction quality control of prefabricated building exterior wall waterproof joint[J]. Construction Engineering and Design, 2016(19):1922. (in Chinese)

[6] Kai Deng, Guoliang Zhu. Waterproof design and node structure treatment of an assembled building exterior wall[J]. Chinese Building Waterproof, 2016(24):15-17. (in Chinese)

[7] Xia Yang, Xiaoliang Zhong. Prefabricated exterior waterproof sealing status and existing problems[J]. Chinese Waterproof Construction, 2016(12):16-18. (in Chinese)

[8] Hong Zhu. Prefabricated assembly (PC) waterproof and seal design and material selection for exterior wall of building[J]. Waterproofing of China, 2016(06):26-29. (in Chinese)

[9] Zhe Zhang. Prefabricated building exterior wall waterproof construction and construction key points[J]. Construction, 2015(04):120-121. (in Chinese)