

## **Discussion on the Training Mode of Assembly-type Construction Talents in Higher Vocational College**

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**Abstract:** With the advancement of industrialization of buildings, prefabricated buildings have been widely promoted as an industrialized building system. The demand for architectural talents in the development of prefabricated buildings is becoming imminent. As a base for talent training, higher vocational colleges should aim at the assembly-type construction talents who cultivate the modern industrialization of buildings and build a training mechanism for assembly-type construction talents. This paper proposes a training mechanism for assembly-type construction talents, and deepens the training mechanism for assembly-type construction talents in higher vocational colleges.

### **1. Introduction**

With the transformation and upgrading of the construction industry, the transformation of architectural talents, assembly and construction technology is an “integrated” technology, involving the whole process of construction management, so the technical, management and construction personnel of the entire industrial chain need to carry out technology and quality [1]. The improvement of the assembly-type construction skills shortage of talents is an arduous task. In the development of college architecture, it is extremely necessary to build a professional education and vocational education system for assembly-type architecture.

### **2. Construction technology of assembly engineering**

#### **2.1 Construction technology for exterior walls.**

For the construction of the assembled PC exterior wall, the construction must be carried out in strict accordance with the construction standards. When designing the plan, the leveling and leveling parameters of the level have been uniformly defined. When constructing on site, the construction personnel must first paste the PE rod or seal on the floor of the building according to the horizontal elevation line [1]. The measuring personnel use the professional level to measure the horizontal line of the PC board. After reaching the construction standard, the construction personnel will slowly put the PC board down, keep the stability of the PC board, support the support with the theodolite, ensure the verticality of the PC board, and finally fix other accessories.

#### **2.2 Lifting work for prefabricated components.**

Prefabricated two systems, dry and wet, have different hoisting procedures. The dry hoisting procedure is to first stake out, then hoist all the prefabricated constructions, and irrigate the slabs. After all the structural construction is completed, the external walls are hoisted. The hoisting procedure of the wet system is to first stake out, then hoist all the prefabricated components, then pour, configure the electromechanical equipment, and finally irrigate the slab. The installation process of the wet system requires attention in the following aspects [1]. When constructing the floor, the upper structure of the wallboard should be poured with cast-in-place concrete, and the lower part of the wallboard is connected by iron; the anchor reserved in the upper part of the wallboard the ribs are to be inserted inside the superposed cast-in-place layer.

#### **2.3 Installation of components.**

There are many processes for connecting components, and cast-in-place and mechanical

connections are often used in engineering. When the connected part is relatively narrow, the connection is made by cast-in-place method. Generally, the casting mold of the concrete is required to be high in this way, and the standard level is required to complete the demolding work smoothly [2]. The mechanical joining method is characterized by high strength, no shrinkage, and a more stable connection of the components, but this method requires the use of higher strength steel bars.

## **2.4 Seam technology.**

With the gradual improvement of the prefabricated construction technology, a reliable technical system has been formed. The construction of the assembled structural joints is a key part of the whole project, which has an important impact on the stability and quality of the overall structure. The connection technology of the fabricated structure at the node position can be divided into dry connection and wet connection. The construction technicians select reasonable joint technology according to the actual situation of the site [2]. When selecting the dry connection technology, it is necessary to obtain sufficient structural bearing capacity and stiffness parameters to ensure the consistency of the cast-in-place box girder structure. It should be noted that the ductility and recovery determined by the joint structure are difficult to meet the consistency with the concrete precast frame.

## **3. The characteristics of prefabricated building technology**

### **3.1 Diversified design.**

At present, there are many load-bearing walls in the building, which makes the opening space small, and the internal space of the building cannot be effectively divided, which cannot meet the diverse needs of people, shown as Fig.1. As for the prefabricated building, the lightweight partition wall can be installed to flexibly divide the space and effectively meet the needs of users [3].



Fig.1 Prefabricated building technology design

### **3.2 Production factory.**

According to the needs of the building, it is processed into a whole wall panel, beam, column, laminated floor and other components in the factory, and water, electric pipelines, windows, etc. are pre-buried in the components, and the wall decoration materials can be made in the factory according to the needs. The assembled building components are produced in the factory and have fixed molds [3]. Therefore, the products have high precision and the products are more standardized, standardized and integrated.

### **3.3 Construction assembly.**

The produced components are transported to the construction site for assembly and construction. Compared with the traditional construction method, the construction process on the site is relatively reduced, and the construction procedures such as mud, plastering, reinforced steel bars and supporting formwork are no longer present, but the construction of the site measurement, hoisting, and component connection is higher [2].

#### **4. Assembly building development status**

At present, China's prefabricated construction industry is still in its infancy, facing the status quo:

1) Component factory: assembly building has high investment threshold and requires strong technology, talents and capital investment, so many small and medium-sized enterprises are struggling. In addition, the degree of generalization of Chinese components is too low, and the layout, space scale and architectural shape of each development project are full of individuality. The architects rarely or even do not consider the standardization and generalization of prefabricated components at the design stage [3]. After the construction drawing design, the factory is again subjected to secondary design, disassembled into a pre-made component processing drawing, and then moved to the workshop to open the mold and produce the components.

2) Construction unit: Affected by factors such as project cost, technology maturity, transportation, and workers' construction technology, even if there is policy encouragement, the construction unit is still rarely used.

#### **5. Bottlenecks in the cultivation of assembled construction technology talents**

Limitation of the dissemination of fabricated building technology theory in order to coordinate and promote the rapid development of China's building assembly, China has provided some support in the training of assembly building technicians.

The shortage of fabricated technology composite talents according to the latest survey data, more than 90% of the first-line production operators in the construction industry are directly employed without any training. As a new development technology of the smart industry, the prefabricated building technology is a professional integrated technology covering the whole process of architectural design, component production, construction and management [1].

College assembly-type talent training fuzzy architecture colleges and universities in the major situation of this industry change, the research on industrial structure is still not thorough, the relevant profession has not been transformed and upgraded in time. According to statistics, there are very few colleges and universities offering assembly-related architecture-related majors across the country. The relevant personnel training standards are not clear.

#### **6. The training mechanism of assembly-type construction talents in higher vocational colleges**

##### **6.1 School and enterprise double education.**

More and more enterprises and colleges have joined the new model of school-enterprise cooperation and training of talents. As a base for talent training and output, colleges and universities have cultivated talents due to the limitations of previous education models, the limited resources of their own resources, the lack of construction methods in China's prefabricated buildings, and the lack of familiarity of teachers in the production operations of fabricated buildings [4]. The talents cannot produce the assembly-type buildings, and the enterprises have great advantages over the construction of the assembly-type construction technology, but the theoretical knowledge is insufficient compared with the colleges and universities.

##### **6.2 School-enterprise cooperation and professional development are oriented to the needs of talents.**

School-enterprise cooperation enrollment, order-style training of assembly-type construction talents, construction of assembly-type construction talents training mechanism in higher vocational colleges, and promotion of professional development in higher vocational colleges. The assembly-type construction enterprise and the university jointly enroll students. On the one hand, the higher vocational colleges contribute to the construction and development of the assembly-type architecture profession, and promote the higher vocational colleges to continuously improve the assembly-type construction education and teaching facilities, improve the quality of personnel training, and promote professional development [4]. On the other hand, enterprises can promote the

training objectives of talents, the quantity and quality of personnel training through joint enrollment with higher vocational colleges, promote the professional level of assembly-type construction enterprises, and enhance the school-enterprise cooperation enrollment to further strengthen the school and enterprises.

### **6.3 School-enterprise culture and education.**

The prefabricated construction talents are jointly cultivated by the teachers of higher vocational colleges and the enterprise tutors. The establishment of the "one-year and two-master" assembly-type construction talents training mechanism, the study determines the teaching standards, professional curriculum standards, job standards, talent quality monitoring standards, and corporate tutor standards. Leading assembly-oriented direction teaching program development, joint industrialization pilot cities to host enterprise research and study, formulation of assembly-based experimental internship standards, school-enterprise cooperation research topics [5]. Promote the deep integration of production and education, and jointly promote the training mechanism of assembly-type construction talents.

### **6.4 Assembled construction education teacher training mechanism.**

The training of assembled construction talents must put forward higher requirements for the construction of the teaching staff. Strengthening the training of assembled construction education teachers has become an indispensable task. First of all, it is necessary to carry out the propaganda of the assembly-type construction talent system, organize the assembly-type construction education teachers of higher vocational colleges to conduct in-depth research and study on all aspects of the assembly-type construction industry chain, determine the quality standards and implementation plans, and strengthen the understanding of the assembly-type construction talents [4].

## **7. The direction of assembly talent training**

Vigorously develop prefabricated buildings, successfully promote the transformation and upgrading of the construction industry, and the cultivation of applied talents is the key. According to the characteristics of prefabricated building technology, combined with the status quo of talents in the construction market, the following three talent training directions are proposed.

### **7.1 Assembly design talent training.**

The requirements of the designer for the prefabricated building are very high, requiring not only the disassembly of the standard components of the equipment, but also a sufficient understanding of the special node construction. Prefabricated buildings are still in their infancy in China, and there are not many existing assembly buildings, so there are very few experienced design talents [5].

Prefabricated components production talent training. In terms of the production of prefabricated components, China still lacks a large number of professional and technical personnel and a team of skilled workers. Many enterprises have faults or connections in key professional technical positions, which cannot meet the needs of the development of prefabricated buildings [6].

### **7.2 Assembly construction talent training.**

The prefabricated building saves a lot of manual links, but the professional quality requirements of the construction workers are higher, and professional assembly technology is required [5]. At present, most of the construction workers' construction experience is basically derived from traditional buildings, which does not meet the technical requirements of assembly-type construction, and requires systematic professional study.

## **8. Thoughts on assembly talent training**

### **8.1 Construct a modular talent training curriculum system.**

According to the three training directions of assembly talent training, the curriculum system is

constructed in a targeted manner and related courses are set up. In the direction of design talents, combined with the national standards for prefabricated buildings, the institute of Architecture, Civil Engineering, Water Supply and Drainage is added to the introduction of assembly-oriented architecture, construction and other related courses, allowing students to access the concept of prefabricated buildings, while strengthening the construction drawings deepen the design [6]. In the direction of the production of prefabricated components, analyze the knowledge and ability of the relevant positions of the component manufacturing enterprises, and develop a new assembly-style building curriculum.

### **8.2 Construct a construction model of “school-integration”.**

The assembly-type construction talents must be deeply integrated with the industry, docking the new technology of the enterprise, and establishing a talent training mode of integration of production and education. Schools and enterprises jointly develop professional teaching standards and curriculum standards for prefabricated buildings, promote the development of teaching materials and teaching resources, and promote project-based teaching and case teaching to ensure the quality of personnel training [4].

### **8.3 Train assembled construction education teachers.**

For the cultivation of assembled talents, the strength of teachers is the key. There are not many professional education related to assembly-type architecture in Chinese universities, and the relevant theoretical systems are not mature. Teachers do not have a thorough understanding of the theoretical knowledge of fabricated buildings, so it is necessary to train teachers. First, send teachers to the prefabricated component production enterprises to learn, understand the component production process, and be familiar with the technical quality requirements of each link [6]. Moreover, teachers should be arranged to carry out practical exercises in the assembly-type construction project department, learn the assembly construction process, master the organization and management of the construction site, and improve the practical ability of the teachers. Secondly, organize teachers to participate in the study of assembly-based architectural education organized by relevant departments to improve the level of education and teaching.

## **9. Summary**

The traditional construction method technology can not meet the needs of prefabricated building construction. The shortage of assembly-type construction talents is a major obstacle to the transformation and upgrading of the construction industry. Therefore, as a talent export base, cultivating assembly-type construction talents is an era call for industrial transformation and transformation. Construction majors should seize the good opportunity of this industry transformation, and proceed from the three aspects of training target system, curriculum system construction and building multi-level practical teaching system, transforming and upgrading traditional architecture-related majors, and enhancing professional and industrial needs. The degree of conformity is solved to solve the problem of training talents in line with the development of modern industries.

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