

Analysis of Factors Affecting Cost of Prefabricated Building

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Abstract

Through combing the literature, this paper finds that the current high cost of prefabricated buildings is mainly due to various factors that affect the cost of prefabricated buildings. Through systematic analysis of the main factors that affect the high cost of prefabricated buildings, the main factors that affect the cost are prefabricated rate and assembly rate, construction form and scale, construction site constraints and actual conditions. Finally, relevant suggestions are put forward to control the cost of prefabricated buildings in order to facilitate the cost analysis of prefabricated buildings.

Keywords

Prefabricated building; cost analysis; AHP method.

1. Introduction

China has vigorously promoted the development of prefabricated buildings in recent years, and prefabricated buildings have advantages over traditional buildings in many aspects. Such as reducing the links of on-site pouring, reducing construction noise and construction waste, thereby protecting the environment. However, the cost of prefabricated buildings is currently higher than that of traditional construction methods, which makes many construction units have concerns about prefabricated buildings. The cost increase of prefabricated buildings mainly appears in the cost of prefabricated components and the cost of installation. This paper finds the main influencing factors of cost increase through the research on the factors affecting the cost of prefabricated construction. In order to provide some ideas and suggestions for reducing the cost of prefabricated construction.

2. Research Background

Premier Li Keqiang proposed in the "Government Work Report" on March 5, 2016: In order to continuously speed up standardization construction and improve construction technology and engineering quality, we should vigorously develop steel structures and prefabricated buildings. The "Outline of the National Thirteenth Five-Year Plan" was officially released on March 17, 2016. The outline pointed out a clear development direction: "promoting prefabricated buildings." The General Office of the State Council issued the "Guidelines on Vigorously Developing Prefabricated Buildings" on September 30, 2016. "Opinions", put forward the goal: "Strive to make the proportion of prefabricated buildings account for 30% of the newly built building area in about 10 years."

With the improvement of technological, economic and environmental requirements, prefabricated buildings are promoting the transformation and upgrading of the construction industry with their prefabricated production of components and assembly construction, and their advantages in short construction period, environmental protection, and energy saving. The production method of lean construction industry has injected strong vitality into the development of construction industry.

3. Factors Affecting the Cost of Prefabricated Construction

This paper sorts out the relevant literature and divides it into three stages: the design phase, the procurement phase, and the construction and installation phases to sort out the influencing factors. The following table shows the cost influencing factors of prefabricated buildings.

Table 1. Factors affecting the cost of prefabricated construction

		Influencing factors	Source literature
design phase X		Prefabrication rate and assembly rate X1	Zheng Bingyun, Cui Zhipeng [1]. Yao Weitao, Lv Haitao [2].
		Construction form and scale X2	Li Liangjie, Huang Xibing[3]. Zhou Jingyang, He Pengwang[4]. Zhao Liang, Han Quqiang[5].
		Construction site restrictions and actual conditions X3	Li Liangjie, Huang Xibing[3]. Jia Hongjun, Xu Yunping[6].
		Standardization degree of precast components X4	Wu Yashuai et al[7] Hui Huixian[8] Zhu Ying[9]
		Split and combination of precast components X5	Xun Zhiyuan et al.[10] Hui Huixian et al.[8] Jia Hongjun et al.[6].
		The repetition rate of prefabricated standard components X6	Li Liangjie, Huang Xibing[3]. Zhao Liang, Han Quqiang[4].
		Design cost X7	Huang Wufei[13]. Chen Yan[14]. Shi Weiguo[15].
		Integrated design level X8	Chen Yan [14]
Procurement stage Y	Procurement stage Y Production stage Y-1	Prefabricated component production cost Y1	Li Liangjie, Huang Xibing[3]. Shi Weiguo[15]. Jia Hongjun et al.[6].
		Production management level Y2	Hui Huixian et al [8]
		Personnel Operation Level Y3	Hui Huixian et al[8] Zhu Ying, Xue Gang[9]. Zhao Liang, Han Quqiang[4].
		Mechanical equipment level Y4	Hui Huixian et al. [8]
		Component factory scale and production capacity Y5	Zhu Ying, Xue Gang[9]. Zhou Jingyang, He Pengwang[4].
	Transportation stage Y-2	Transportation cost Y1	Li Liangjie, Huang Xibing[3]. Shi Weiguo[15]. Jia Hongjun et al. [6].
		Short storage fee for components Y2	Yao Weitao, Lv Haitao [2]. Huang Wufei [13]. Zheng Shengqin et. al. [16]
		Transport distance Y3	Zhu Ying, Xue Gang [9].

		Transportation efficiency Y4	Zhou Jingyang, He Pengwang[4].
		Vehicle loading scheme Y5	Zhu Ying, Xue Gang[9].
Construction and installation stage Z		Construction and installation technology Z1	Zheng Bingyun, Cui Zhipeng[1]. Wu Yashuai et al.[7].Hui Huixian et al[8]
		Construction plan Z2	Xun Zhiyuan et al.[10] Hui Huixian et al.[8]
		Construction site layout Z3	Li Weidong et al. [11] Luo Wei[12]
		Construction and installation cost Z4	Huang Wufei[13]. Chen Yan[14] Zhao Liang, Han Quqiang[4].
		Installation efficiency Z5	Chen Yan [14]
		Management level Z6	Chen Yan [14]

4. Cost Control Measures

4.1. Reduce Prefab Rate

At this stage, some local governments simply pursue a higher prefab rate, resulting in PCs on the market. the demand for components will increase in the short term, causing the supply of PC components in the market to exceed supply, which will inevitably increase the cost of PC components. The corresponding construction and installation costs of prefabricated concrete buildings will increase, and developers' willingness to invest in prefabricated buildings will decrease, Contrary to the original intention of the government to promote prefabricated buildings, and is not conducive to the promotion and development of prefabricated buildings. Therefore, the current local government should formulate a reasonable prefabrication rate based on the local reality, instead of blindly pursuing a higher prefabrication rate. In order to better develop prefabricated buildings, we should reduce the cost of PC components by reducing the prefabrication rate. To achieve the purpose of controlling the higher cost of PC components.

4.2. Promote BIM Technology

Vigorously promote the combination of assembly technology and BIM technology, by establishing an information platform, and then building an information management system on the basis of the platform, so as to integrate the planning and design, manufacturing, assembly and construction, operation and maintenance stages of the assembly building project Various resources make cost information flow smoothly among departments at various stages, promote information communication between various departments of the enterprise, solve the problem of comparing contract prices, target costs, and actual costs in prefabricated construction projects, and find the most reasonable path to control costs. Promote enterprise innovation and development.

4.3. Cost Control in all Stages of Prefabricated Construction

In the design stage and production stage, control the utilization rate of PCs such as molds to reduce operating and management costs. During the transportation stage, increase the number of factories and allocate factory locations reasonably to reduce transportation costs. At the installation stage, cultivate talents to improve installation efficiency. Prefabricated building components need to be manufactured from the factory and then transported to the construction site, which increases the transportation cost of the prefabricated components and

the cost of setting up factories. The state expands the production scale and increases the industrial agglomeration effect, which is conducive to reducing the transportation cost of PC components. Thereby reducing the purchase cost of prefabricated components of prefabricated buildings.

5. Conclusion

This paper concludes that the influencing factors of the prefabricated building cost include prefabrication rate and assembly rate, construction form and scale, construction site constraints and actual conditions, construction site constraints and actual conditions, etc., in order to promote future assembly cost analysis. The advantages of vigorously promoting prefabricated buildings are to seize the main cost influencing factors, reduce the prefabrication rate, implement BIM technology, carry out cost control in all stages of prefabricated buildings, and achieve sustainable development. If the government and related construction companies want to promote prefabricated buildings in depth, the government should increase policy encouragement and establish a complete prefabricated building industry chain.

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