Study on the Mechanism of Construction Engineering Supervision in Green Construction and Energy Saving Management

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Abstract: This paper discusses the mechanism of construction project supervision in promoting green construction and energy-saving management. Firstly, the paper analyzes the role of supervision in four dimensions: quality supervision, resource and energy management, environment and safety guarantee, and coordination and communication. Secondly, it expounds that the supervision realizes its function through planning review, supervision and inspection, technical support, communication and coordination and evaluation feedback. Finally, a dynamic circular mechanism model with the supervision unit as the core and covering all subjects, objectives and means elements is constructed, and some application suggestions at the policy, enterprise and technical levels are put forward. The research results show that construction engineering supervision plays an important role as coordinator and supervisor in green construction and energy-saving management. Through effective mechanism innovation, information asymmetry and execution deviation can be effectively solved, and the green and sustainable development of the construction industry can be promoted.

1. Introduction

Global climate change has become one of the most severe challenges facing human society in the 21st century. In this context, China clearly put forward the goal of "double carbon". As the core link of building carbon reduction, green construction and energy-saving management directly determine the success or failure of industry transformation. However, the current green construction practice still faces significant challenges. On the one hand, the construction party is limited by technical ability and cost pressure, and the phenomenon of energy-saving measures "reaching the standard on paper and actually shrinking" often occurs [1]; On the other hand, due to the lack of dynamic monitoring means, it is difficult for the owner and the supervision department to evaluate the resource consumption and environmental impact of the construction process in real time [2]. In this situation, as a third-party management subject independent of Party A and Party B, the role of construction project supervision is extending from the traditional "quality and safety gatekeeper" to "green construction coordinator" and "energy-saving benefit supervisor" [3]. How to solve the problem of information asymmetry and execution deviation in green construction through the innovation of supervision mechanism has become the focus of both academic and industry.

2. Analysis on the function mechanism of construction project supervision

2.1 Function dimension division

2.1.1 Quality supervision dimension

In green construction and energy-saving management, quality is the cornerstone. The supervisor should ensure that the green building materials and energy-saving equipment meet the quality standards, for example, strictly check the thermal conductivity and fire resistance of new thermal insulation materials to avoid the impact of material quality defects on energy saving and overall building quality [4]. For energy-saving related construction technology, such as the process compliance and construction accuracy of external wall thermal insulation construction technology, we should control it to prevent quality problems such as poor thermal insulation effect caused by

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improper construction. In concealed works, the supervisor should carefully inspect the concealed parts such as energy-saving pipeline laying and energy-saving roof structure before covering to ensure the construction quality to meet the standard and lay a solid quality foundation for green construction and energy-saving management.

2.1.2 Dimensions of resource and energy management

Efficient utilization of resources and energy is the core of green construction. From the perspective of resource management, the supervisor supervises the construction unit to rationally plan the construction site, reduce the waste of land resources, optimize the layout of the material stacking site, and avoid the loss of resources caused by repeated handling. In material management, check the purchasing plan and use of materials to prevent material waste and excessive accumulation. In terms of energy management, the construction unit is urged to choose energy-saving construction equipment, and the running time and load of the equipment are reasonably arranged, such as the construction elevator with frequency conversion technology to reduce energy consumption [5]. Check the temporary electricity and water facilities on the construction site, put an end to energy waste such as leakage, and realize refined management of resources and energy.

2.1..3 Dimension of environment and security

Green construction emphasizes reducing the negative impact on the environment. The supervisor should supervise the construction unit to implement dust control measures, and regularly sprinkle water on the construction site to reduce dust pollution to the atmospheric environment [6]. In terms of noise control, the construction unit is required to arrange the construction time reasonably and take noise reduction measures for high-noise equipment to meet the Environmental Noise Emission Standard for Construction Sites. In terms of waste disposal, supervise the construction unit to collect and reasonably dispose of construction waste, and improve the recycling rate of waste [7]. At the same time, safety is the premise of green construction, and the supervisor should review the safety management system and check the safety protection facilities to ensure the safe and orderly construction process and avoid the impact of safety accidents on the green construction process and the effectiveness of energy-saving management.

2.1.4 Coordination and communication dimension

Green construction and energy-saving management involve many subjects such as construction units, design units, construction units and material suppliers. As a coordinator, the supervisor needs to build a communication bridge. Keep close communication with the construction unit, understand its green construction objectives and energy-saving requirements, and feedback the construction progress and problems in time. Communicate with the design unit on the constructability and optimization space of the energy-saving design scheme to ensure that the design intention falls accurately in the construction [8]. Coordinate the internal departments of the construction unit to ensure that green construction and energy-saving management measures are promoted in all aspects of construction. For material suppliers, the supervisor should ensure that the green materials and energy-saving equipment provided by them are delivered on time and in good quality, and through effective coordination and communication, all parties should unite their strength to jointly promote green construction and energy-saving management.

2.2 Action path

In the early stage of the project, the supervisor participated in the planning of green construction and energy-saving management. According to the characteristics of the project and relevant standards, assist the construction unit to formulate clear and operable green construction and energy-saving targets, such as determining the building energy-saving rate index and the water resources reuse rate target. Review the green construction scheme and energy-saving special construction scheme prepared by the construction unit, and put forward opinions and suggestions from the aspects of technical feasibility, economic rationality and high efficiency of resource

utilization, so as to guide the construction unit to optimize the scheme [9]. In the process of construction, the supervisor supervises the implementation of green construction and energy-saving management measures in an all-round way according to the planning and relevant standards and specifications. Patrol the construction site regularly to check whether the use of green building materials is consistent with the plan and whether the energy-saving equipment is operating normally. In view of the problems found, the rectification notice was issued in time, and the construction unit was required to rectify within a time limit, and the implementation of rectification was tracked [10]. If the phenomenon of running water and ever-burning lamps is found in the construction site, the construction unit is immediately required to rectify and strengthen energy management. Through strict supervision and implementation, ensure the effective implementation of green construction and energy-saving management measures in the construction site.

Building engineering supervision relies on professional knowledge and rich experience to provide technical support for green construction and energy-saving management. When the construction unit encounters technical problems when adopting new technologies, new processes and new materials, the supervisor can organize experts to demonstrate and provide solutions. When promoting the application of solar photovoltaic building integration technology, the supervisor assists the construction unit to solve the technical problems such as the installation angle of photovoltaic panels and the combination with the building structure, so as to ensure the smooth application of new technologies. At the same time, the supervisor is also responsible for collecting and sorting out the new technical information of green construction and energy-saving management, recommending it to the construction unit and the construction unit, promoting technological innovation and application, and improving the green and energy-saving level of the project.

The supervisor regularly evaluates the effect of green construction and energy-saving management. According to the relevant evaluation standards, the energy-saving effect, resource utilization efficiency and environmental impact of the project are quantitatively evaluated [11]. Through the data of energy consumption monitoring system, the actual effect of building energy-saving measures is evaluated. Feedback the evaluation results to the construction unit and the construction unit in time, affirm and popularize the outstanding links, and put forward improvement suggestions for the shortcomings. According to the feedback, the construction unit and the construction unit adjust the management strategy and construction method, form a closed-loop management, and continuously optimize the green construction and energy-saving management.

2.3 Construction of action mechanism model

The main elements include the construction unit, supervision unit, construction unit, design unit and material supplier. The construction unit provides project funds and overall goal orientation; The supervision unit is responsible for the supervision, management and coordination of all parties; The construction unit specifically implements green construction and energy-saving management measures; The design unit provides a green design scheme; Material suppliers guarantee the supply of green materials and energy-saving equipment. Target elements include energy-saving target, environmental protection target (reducing pollutant emission and protecting ecological environment), resource utilization target (improving resource recycling rate and reducing resource waste) and quality safety target (ensuring green construction quality and construction safety). Means elements include planning review means (review of green construction and energy-saving schemes), supervision and inspection means (on-site inspection and regular inspection), technical support means (expert argumentation and technical recommendation), communication and coordination means (organization of meetings and information transmission) and evaluation and feedback means (effect evaluation and feedback).

The model structure is shown in Figure 1. Taking the supervision unit as the core, the radial structure is constructed. The supervision unit interacts with the construction unit, design unit and construction unit by means of planning review, and defines the objectives and schemes of green construction and energy saving; Real-time supervision of the construction process of the

construction unit by means of supervision and inspection, and close contact with the construction unit; By means of technical support, solve technical problems for construction units and other parties and promote technical exchanges; By means of communication and coordination, build a communication bridge between the construction unit, design unit, construction unit, material supplier and other subjects to ensure smooth information; By means of evaluation feedback, the evaluation results will be fed back to the construction unit and the construction unit, prompting all parties to optimize and improve. All the elements are interrelated and interact with each other, forming a dynamic cycle mechanism model.

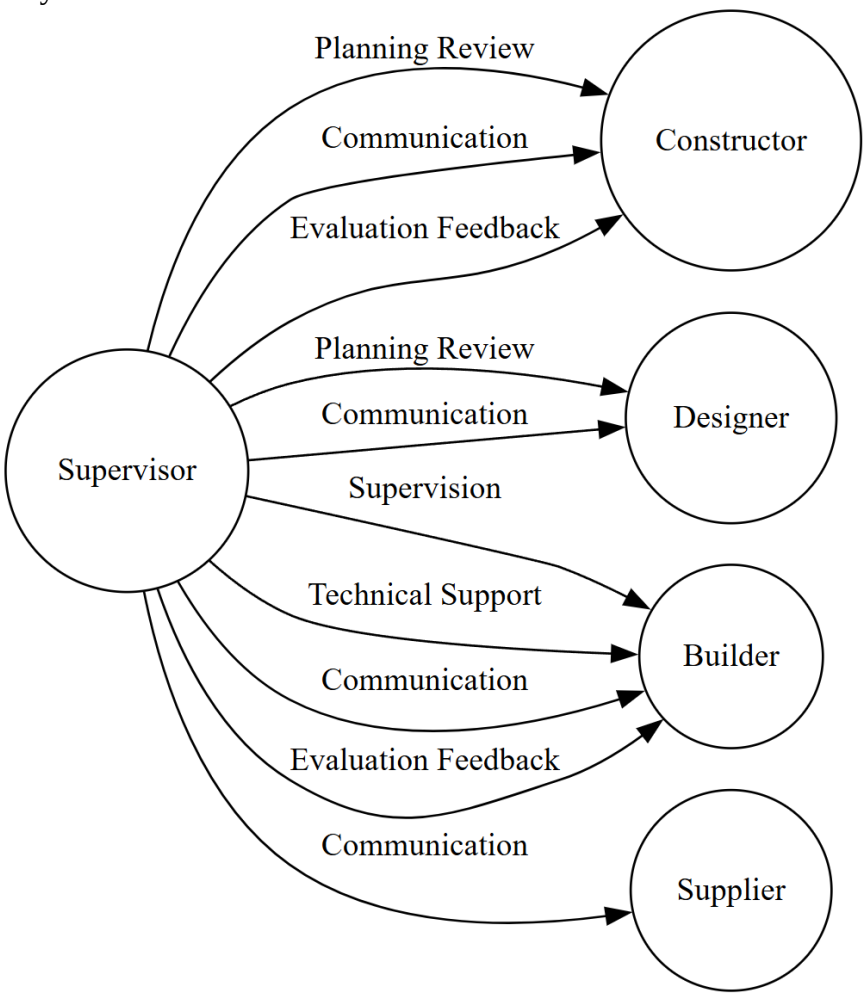

Figure 1 Model structure

As shown in Figure 2, at the start-up stage of the project, all parties, under the organization of the supervision unit, determine the green construction and energy-saving management plan according to the target elements. In the implementation stage, the supervision unit uses the means of supervision and inspection, technical support and communication and coordination to ensure the construction unit to implement according to the plan, while maintaining close interaction with all parties. In the periodic evaluation stage, the supervision unit evaluates the project according to the evaluation feedback means, and feeds back the results to all parties. All parties adjust their strategies and actions according to the feedback, and so on, so as to promote the continuous improvement of green construction and energy-saving management and realize the green sustainable development goal of construction projects.

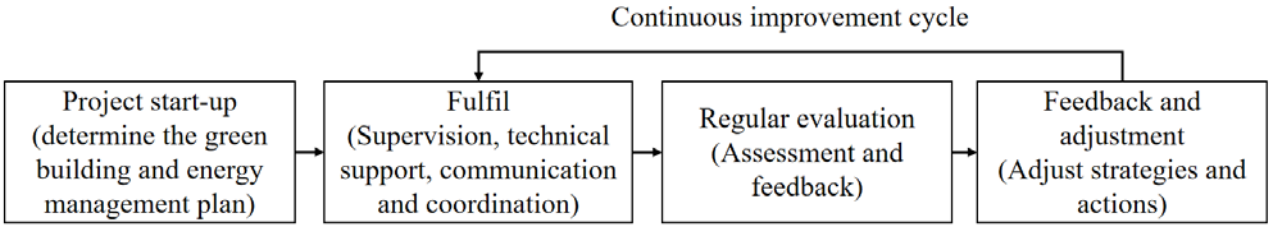

Figure 2 Model operation process

3 Application suggestions and countermeasures

3.3 Policy level

The government should issue more detailed and specific green construction and energy-saving management regulations, clarify the roles and responsibilities of construction project supervision, and ensure that the supervision work has laws to follow and rules to follow. Formulate unified green construction and energy-saving management standards and operating guidelines to provide clear work guidance for supervision units and facilitate exchanges and learning in the industry. The government can encourage enterprises and projects to adopt green construction technology and energy-saving measures through financial subsidies, tax relief and other measures to reduce the cost pressure of enterprises. Through the media, seminars, training courses and other forms, popularize the knowledge of green construction and energy-saving management, and improve the environmental awareness and energy-saving awareness of the whole society.

3.2 Enterprise level

Enterprises should formulate and improve the internal rules and regulations of green construction and energy-saving management according to the relevant national and local laws and regulations and their own actual conditions. Through regular training and assessment, improve the professional knowledge and skills of supervisors in green construction and energy-saving management, and strengthen their sense of responsibility and mission. Enterprises should actively explore and adopt new technologies, new materials and new processes to improve construction efficiency, reduce waste of resources and reduce energy consumption. Establish a performance evaluation system for green construction and energy-saving management: through establishing a scientific and reasonable performance evaluation system, quantitatively evaluate the effects of green construction and energy-saving management, find problems in time and take improvement measures.

3.3 Technical level

Promote the application of BIM technology in green construction and energy-saving management, use BIM technology for construction simulation and energy consumption analysis, optimize design scheme and improve resource utilization efficiency. By installing sensors and cameras, the energy consumption and environmental conditions of the construction site can be monitored in real time, and the construction strategy can be adjusted in time. Encourage scientific research institutions and enterprises to cooperate to develop new energy-saving and environmentally-friendly materials to replace traditional building materials with high energy consumption and high pollution. Through technical innovation and management innovation, the construction technology and flow are optimized to reduce unnecessary energy consumption and waste of resources.

4. Conclusion

As a third-party management subject independent of Party A and Party B, the role of supervision has extended from the traditional "quality and safety gatekeeper" to "green construction coordinator" and "energy-saving benefit supervisor". Through the four dimensions of quality supervision, resource and energy management, environment and safety guarantee and coordination

and communication, the supervisor ensures that green building materials and energy-saving equipment meet the quality standards, optimizes the utilization of resources, reduces environmental pollution, and promotes effective communication among multiple subjects. In the early stage of the project, the supervisor participated in planning and reviewing the construction scheme; In the process of construction, conduct all-round supervision and rectify problems in time; At the same time, provide technical support, evaluate the management effect and form a closed-loop management. The main elements of the construction include the construction unit, supervision unit, construction unit, design unit and material supplier, etc. The target elements include energy saving, environmental protection, resource utilization and quality and safety, and the means elements include planning review, supervision and inspection, technical support, communication and coordination, evaluation and feedback, etc. The model structure takes the supervision unit as the core, and all the elements are interrelated, forming a dynamic circulation mechanism, promoting the continuous improvement of green construction and energy-saving management, and realizing the green sustainable development goal of construction projects. At the policy level, it is suggested to strengthen the formulation of laws and regulations and the guidance of standards; at the enterprise level, we should improve internal rules and regulations and improve the quality of personnel; at the technical level, we should promote the application of BIM technology and encourage innovative research and development. Through these measures, the greening and energy-saving level of construction projects can be effectively improved.

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