

Discussion on Engineering Cost Control and Management under EPC Mode

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Abstract: The EPC general contracting mode is currently a popular engineering contracting mode, which is fully known as engineering procurement construction, which is a contracting management mode that covers design, procurement, and construction. This engineering contracting model aims to achieve safer, higher quality, and more reasonable engineering construction goals by coordinating various tasks involved in engineering construction. This article summarizes the management characteristics of the entire process cost control work under the EPC general contracting mode, sorts out the overall work process and key points, and finally proposes optimization strategies for the entire process cost control work under the EPC general contracting mode.

1. Introduction

Cost management of engineering projects is the key to ensuring the overall efficiency of investment in engineering funds, and is also an important way to achieve maximum utilization of funds. As a new management model, the EPC general contracting model runs through the entire process of engineering projects and has become a trend in current engineering construction project management. The article studies the entire process of engineering cost management implemented in various stages of the EPC general contracting model, and verifies the reliability and feasibility of the research viewpoint through empirical analysis. EPC, as an emerging technology, has penetrated into various disciplines and industries, including changes in engineering costs. The use of this technology has greatly improved the quality and efficiency of engineering cost control, so it is necessary to explore the application of EPC technology in engineering cost control.

1.1 Overview of EPC General Contracting Model and Whole Process Cost Management

The EPC (Design, Procurement, Construction) engineering general contracting model originated in the 1980s in the United States and is currently actively advocated and promoted in the domestic construction market. This mode of contractor can intervene in the project early, combining design knowledge and construction experience, effectively controlling the construction period, quality, and cost. It greatly tests the situation. Most of the contractor's understanding of the EPC mode is limited to expanding the business scope, and the research on cost is far from meeting the practical requirements. Contractors should use cost management theory knowledge to guide design and construction based on the characteristics of EPC projects, ensuring that construction drawing design optimization is carried out without reducing the use of functions, avoiding the risk of exceeding the budget of EPC projects, consolidating budget quality, controlling engineering costs, and improving project efficiency.

The construction process of a construction project from decision-making to completion and delivery for use generally includes four stages: preliminary decision-making, project development, project implementation, completion acceptance, and post evaluation. In order to adapt to the establishment of economic relationships among various parties in the engineering construction process and meet the requirements of project management and engineering cost control, it is necessary to calculate prices multiple times according to the construction stage: prepare project investment estimates in the early decision-making stage, prepare design estimates and construction drawing estimates in the project development stage, determine the contract price, determine the settlement price in the project implementation stage, and prepare the completion final account in the completion acceptance stage. The entire pricing process goes from coarse to fine, from shallow to deep, and is

interconnected. The former restricts the latter, while the latter supplements the former. Therefore, engineering cost work has four prominent characteristics, namely: ①the total cost of engineering projects is relatively large. ②The engineering cost has strong dynamism and variability. The construction cycle of engineering projects is generally long, and sudden factors are prone to fluctuations in various costs during this process. Therefore, engineering cost work has strong dynamism. The variability of this work is mainly due to the large variety of engineering types in various parts of the engineering project, and the significant differences in the methods and processes adopted, which leads to the variability of engineering cost work; ③Engineering cost work has a strong complexity. Due to the fact that engineering projects have multiple sub projects and each part is closely connected, problems in one link can affect several links. The EPC general contracting contract is an important step in establishing the overall engineering cost work, and is also an important basis for future project construction, completion acceptance, and project settlement. It involves the common economic interests of both parties. Therefore, as a cost management personnel, they must participate in it and fully play their active role.

2. Explore the EPC application in various decision-making stages

2.1 Application of EPC in Engineering Bidding Stage

In the EPC general contracting mode, the pricing form of the contract is one of the key factors in the engineering general contracting contract. Usually, construction projects will adopt several pricing methods, such as fixed total price, fixed unit price, and downward floating rate. Due to different actual situations, the pricing methods used are also different, and the applicable situations are also different. According to different pricing methods, the performance of owners and contractors in terms of rights, obligations, responsibilities, and risks may also vary. In recent years, with the introduction of relevant policies by the national and local governments at all levels, the development of the general contracting construction model has been vigorously promoted, and the general contracting has become a mainstream construction model. The accuracy of bidding control price is an important link in investment control. For projects that adopt the engineering general contracting mode bidding, due to the timeliness of the project, the depth of the design drawings is often impossible to reach the depth of the construction drawings, and the quantity of work cannot be accurately determined during the bidding stage. Therefore, it is necessary to relatively accurately determine the engineering cost bidding control price of the engineering general contracting project at different design depths.

In the preliminary design stage, according to the characteristics of the project, EPC general contracting projects can generally choose to conduct bidding and tendering work after feasibility study, scheme design completion, and preliminary design completion. The higher the stage of the bidding selection construction cycle, the greater the difficulty in demonstrating project requirements, and the rougher the description of functional requirements and details. If the owner has relevant management experience and clear functional requirements for a certain type of project, such as residential engineering, standard factory building engineering, etc., they can choose any stage for bidding. If the owner lacks experience in a certain type of construction project, it is best to choose to conduct bidding after the preliminary design is completed, so that the owner has relatively more time to propose their own needs and can have multiple rounds of communication with the design unit to ensure that the requirements are constantly clear and clear.

2.2 Application of EPC during the construction phase of the project

Construction is the process in which the general contractor consumes the most labor in the EPC project. Therefore, it is necessary to appropriately control construction costs. The general contractor can take the following measures to implement project cost management: 1. Select qualified subcontractors. During the implementation of EPC projects, there are multiple subcontractors and subcontracting contracts. Therefore, scientific and effective management of subcontractors is the cornerstone of the success of EPC projects and the key to engineering cost management. Strengthen the awareness of quality cost control. When considering improving quality and shortening

construction period, the general contractor should consider the relevant quality and construction period costs. The general contractor should actively seek the best intersection between quality cost and schedule cost to reduce project costs. Most construction companies' engineering material procurement work is carried out by dedicated personnel to coordinate with long-term upstream material suppliers, which ensures the stability of the quantity and quality of supplied materials and helps enterprises carry out long-term production and construction activities. However, long-term cooperation can also lead to inertia in the work of procurement personnel and quality inspection personnel, leading to a decrease in the rigor of work. This leads to the gradual disconnection of the quality and price of the materials used with the market as the cooperation progresses, and even leads to the phenomenon of high prices and low quality of procurement materials, and corruption in the cooperation process. Therefore, it is necessary to promote the entire process cost control work under the EPC mode, promote the unified management of raw material procurement, management, and requisition, and ensure the scientific and rigorous cost control management during the construction process.

2.3 Application of EPC in the Engineering Contract and Settlement Phase

After the completion acceptance of the project, the project department should promptly return the leased equipment, clean up the site, and evacuate unnecessary management personnel as soon as possible. Cost management personnel conduct engineering cost accounting, analysis, assessment, and settlement preparation based on cost data, contracts, as-built drawings, change materials, visas, and other materials. Due to the possibility of cost related adjustments during the construction process, some controversial cost adjustments require cost management personnel to consult with multiple parties, collect relevant evidence, and obtain reliable information before settlement adjustments can be made. EPC construction contracts often stipulate the proportion of project payment corresponding to the completion of settlement. Therefore, timely settlement work is beneficial for contractors to obtain project funds as soon as possible, reducing financial pressure. When bidding for EPC projects, the preliminary design is often incomplete and the amount of limit design is agreed upon. Therefore, the preliminary design plan should be optimized based on the preliminary information and contract content provided by the owner, Review the engineering budget estimate (currently more and more projects are using simulated lists) for any omissions, exceeding design limits, or contract scope. The contractor can deepen the design of the professional engineering to be subcontracted in conjunction with the professional subcontracting unit, while preventing the professional subcontracting unit from expanding the deepening design beyond the approved budget or the maximum price of the simulated list.

2.4 EPC Application during Engineering Design Phase

The project design work under EPC mode is a systematic work that involves connecting various stages of design, procurement, and construction, taking into account various factors comprehensively. Among them, planning and managing cost in design work is an important part of project design work under EPC mode. By scientifically and reasonably controlling the cost limit, we can effectively grasp the approximate scope of engineering cost work from the early stage, comprehensively plan the working methods and paths of engineering cost work, and ensure the rationality of the amount of engineering funds invested. EPC is the "design procurement construction" model, also known as the turnkey engineering general contracting model, which refers to the general contracting contract signed between the engineering construction department and the enterprise, stipulating that the enterprise conducts engineering design, procurement, construction, etc. The entire process management mode of this stage usually adopts a fixed total price contract mode, and the enterprise is responsible for the quality, safety, cost, and schedule management of the engineering project. Whole process engineering cost management is a new method of cost management for construction projects, emphasizing the determination and control of project costs.

At different stages of the engineering construction process, the contractor's engineering cost management also has different work contents. (1) In the preliminary design stage of the project, optimize the design plan and construction plan based on the maximum price limit design or simulation

list; (2) During the construction drawing design stage, optimize the construction drawing design according to the approved preliminary design and prepare a construction drawing budget. The project design work under EPC mode can be more refined, scientific, and designed in advance, planning in advance, and establishing various models. The application of EPC technology in engineering cost is the main development trend and need in current society. Against the backdrop of the continuous improvement of China's scientific and technological level, the country calls for the vigorous development of secure and intelligent information technology, and various industries should actively integrate information technology. From this perspective, the application of information technology has become the main development trend in the field of engineering construction. Therefore, it is very necessary to apply EPC technology in engineering cost.

3. Prospects for the Application of Artificial Intelligence Technology in Engineering Cost

With the rapid development of information technology, the application of artificial intelligence technology in the field of construction engineering is an inevitable trend in the development of construction engineering. In artificial intelligence technology, computer technology serves as an important technical guarantee. The application of artificial intelligence technology in construction cost estimation research is of great significance. Artificial intelligence technology can ensure the accuracy of data estimation and improve the economic benefits of construction projects. From the current application status of artificial intelligence technology in engineering cost, it can be seen that this technology is gradually developing towards the development of multi expert collaborative systems and tools. By constructing a large-scale distributed artificial intelligence development environment, good technical conditions are provided for engineering cost work.

4. Conclusion

In summary, with the gradual and rapid development of China's economy, many artificial intelligence technologies have been gradually valued by people. Through industrial restructuring, due to the improvement of personnel skills, the depth of understanding of artificial intelligence technology has been continuously strengthened, and the rapid development of technological means, it has gradually become widely used in the production field, becoming one of the mainstream technological means in contemporary society, and gradually becoming a focus of attention. Due to the rapid development of computer technology and information technology, the application of artificial intelligence technology in construction engineering is the trend of construction engineering development. One important technical support in artificial intelligence technology is computer technology, so we must spare no effort in developing computer technology. On the basis of estimating the cost of construction projects, promoting research on artificial intelligence technology has immeasurable application value. Artificial intelligence technology has great help in improving the accuracy and rationality of data estimation, and has improved the economic benefits of construction projects. The entire process cost management work under the EPC general contracting mode is a contracting and construction mode that covers all aspects of design, procurement, and construction, including the investment decision-making stage, bidding and quotation stage, contract negotiation stage, design stage, subcontracting and cost control stage, construction stage, and completion stage. There are numerous problems and risks involved in this mode.

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