

The Standardization System of Water Conservancy Project Cost Management under the EPC General Contract Mode

Sha Li¹, Yijia Wang², Yu Zeng¹

¹Zhejiang Tongji Vocational College of Science and Technology, Hangzhou, 311231, Zhejiang

z20220070902@zjtongji.edu.cn

Abstract: It is the development trend for water conservancy project to adopt EPC general contract mode. The realization of scientific and effective project cost management under total price contract is the key to guarantee the contractor's economic benefit. Based on the contractor's perspective, this paper sorts out the content of cost management at each stage, clarifies the responsible subject of cost management at each stage, and explores the construction of cost management standardization system.

1. Introduction

EPC refers to the whole process or several stages of contracting for the design, procurement, construction, and trial operation of construction projects by the company in accordance with the contract. As a brand-new engineering project management model, due to its characteristics such as effectively shortening the construction period, reducing project costs, reducing disputes, and optimizing resource allocation, the EPC general contract model has been adopted by a large number of water conservancy construction projects in recent years.

At present, the EPC general contract mode of water conservancy projects is generally a lump-sum contract, the contractor needs to face the cost control risks in the whole process from project undertaking, planning, design, procurement, construction to commissioning and acceptance. Under the EPC general contract model, the realization of scientific, comprehensive, and whole-process cost management is the key to the project management of the contractor. For this reason, domestic and foreign scholars have conducted research on cost management under the EPC model. Professor W. Edward Back and Karen A. Moreau from the United States conducted special research on the impact of information management, project cost and schedule under the EPC model. Longlong Sun^[1] systematically analyzed and put forward the key points, specific methods and operability of cost control at each stage of the EPC project. Min Chen^[2] decomposed the main tasks of cost management according to different stages. Guangyu Lan^[3] proposed that the EPC project cost management of water conservancy projects should establish a total cost management system for the general contractor. Although domestic scholars have proposed that a standard system for cost management of the entire process under the EPC model should be established, and emphasized the importance for realizing project cost control. However, it is limited to the theoretical proposal, and it has not formed an operable EPC model for the whole process cost management standard system.

The construction period of water conservancy projects is long, the project is complex, and there are many external influencing factors^[4]. So it is difficult to achieve the cost management objectives. This paper investigates and analyzes the practice of water conservancy project cost management under the



general contract mode, deeply analyzes the cost management content of each stage, clarifies the main body of cost management at different stages, etc., and scientifically builds the EPC general contracting model cost management standardization system.

2. Analysis of the work content of cost management in each stage under EPC mode

The EPC general contract process is generally divided into six stages: undertaking, planning, design, procurement, construction, and commissioning and acceptance. It can be seen in table 1 that, at different stages, the content of the cost management work of the contractor is different.

Table 1. Work content of cost management at each stage under EPC mode

Stage name	Main work	Cost management work content	Control measures
Undertaking stage	Obtain and analyze project information; prepare bidding documents; sign contract	Prepare bid quotations; determine the cost of the general contract after winning the bid	Cost and profit analysis; analyze potential competitors, formulate bidding strategies, and determine quotations.
Planning stage	Preparation of project management and project implementation plans	Formulate general contracting cost control objectives; decompose the cost, prepare a cost control plan and determine the contractor's control estimate	Through the implementation plan, carry out task decomposition and determine the cost target of each task
Design stage	Preliminary design, construction drawing design	Open the limit, prepare the preliminary design budget and construction drawing budget	Analyze the project value and select the best plan; design the limit and control the cost to be lower than the total contract price
Procurement stage	Procurement of materials, equipment (or construction)	Prepare procurement plans and procurement budgets, control the procurement cost of construction materials and mechanical and electrical equipment; sign contracts	Through a competitive procurement system, select high-quality and low-cost equipment, materials, services (or construction)
Construction stage	Civil engineering construction, electromechanical equipment and metal structure engineering production and installation	Prepare construction plan and construction budget, control construction cost of construction and installation project	Strengthen the cost control of subcontracted projects; scientifically manage construction changes, and do a good job in claims and counter-claims
Production acceptance stage	Joint trial operation, commissioning and handover, project acceptance	Preparation of completion settlement and project final accounts	Strictly review the engineering quantity and new unit price of the subcontracted project, do internal settlement; do the calculation of the change and claim cost in conjunction with the general contract, and prepare the project final account

3. Responsible body of cost management at each stage under EPC mode

As there are multiple parties involved in EPC general contract mode, there are both general contractors and subcontractors, as well as owners and supervisors. At different stages, all parties played different roles and assumed different responsibilities. Therefore, according to the main points of cost management, determining the main body of responsibility for the different stages of the total cost management is an important content of the whole process cost management standardization system.

3.1. The main body of cost management in the undertaking stage

General contracting bidding is conducted during the feasibility study stage for general water conservancy projects. In order to effectively control project investment, owners often set bidding control prices as the maximum price. Whether the control price is reasonable will directly affect the development of subsequent general contracting. Therefore, at this stage, the owner is the main body of cost management. At the same time, the contractor will determine the bid quotation after obtaining the bidding information through cost and profit analysis. Therefore, in the undertaking stage, the main body of cost management is both the owner and the contractor.

3.2. The main body of cost management in the planning stage

After signing the general contract, the contractor as the main body began to implement cost management. First, the contractor will determine the overall goal of project cost control, then carry out task decomposition, and formulate the cost of each decomposition task, and finally prepare the overall control estimate of the project. This estimate will become the highest limit for the entire process of cost control in the future.

3.3. The main body of cost management in the design stage

In the design stage, the contractor will carry out a preliminary design based on the approved feasibility study report. In order to control the cost to be lower than the total control estimate, the contractor, as the main body of responsibility, will carry out quota design. Through multi-scheme comparison and selection, value engineering analysis and other scientific and technological means, the most economical and reasonable design is used to meet the requirements of the owner and made the project function, scale and benefit best.

3.4. The main body of cost management in the procurement stage

40~60% of the cost of water conservancy projects are materials and equipment costs, so procurement is an important part of cost management. On the one hand, contractors determine material and equipment suppliers through bidding, and realize cost control at the procurement stage by compiling bidding control prices. On the other hand, subcontractors obtain subcontracts through competition in quotation, reputation, and technical parameters. Therefore, in the procurement stage, the main body of cost management is contractors and subcontractors.

3.5. The main body of cost management in the construction stage

The construction stage is the formation stage of the water conservancy project, and it is also the stage where the project cost is the most concentrated and the largest.^[5] Therefore, it is the most critical stage for the management and control of the general contracting cost. At this stage, the contractor, as the main body of responsibility, must coordinate the design, construction, material and equipment supply and other parties. By formulating and implementing construction budgets, construction plans, and schedules, scientifically and rationally allocate human resources, materials, and construction equipment to ensure that the project is implemented as planned. At the same time, the contractor need to strictly control construction changes, reduce the risk of subcontractors' claims, and achieve project cost control.

3.6. The main body of cost management in the production acceptance stage

In the final link of project construction, the contractor, as the main body, should strictly review the project volume and additional costs in accordance with the provisions of the contract, and do a good job of internal completion settlement with each subcontractor. In accordance with the provisions of the general contract, the contractor should organize and collect data, implement changes and claims for expenses, and finally complete the preparation of project final accounts. At the same time, they need cooperate with relevant departments to do a good job in project audit and price evaluation.

4. Standardized system of cost management in the whole process under EPC mode

The EPC whole-process cost management of water conservancy projects is a systematic and diversified work. There are many stages, many participants, and complex relationships. After sorting out the responsible entities of cost management at each stage, the cost management standardization system of the EPC general contract model of water conservancy projects, as shown in Figure 1, is finally established according to the work process and the degree of correlation.

In the whole-process cost management system, the owner mainly implements ex-post control. In the early stage, they mainly control the contract price of the project, the preliminary design review in the mid-term, and the final project account review in the later stage. The work of process control is mainly completed by the supervisor, and every key link in the implementation of the supervision project is implemented. The competent department of the industry mainly conducts administrative management of the project. The EPC general contractor is the main body of the implementation of the cost management of the whole process, and undertakes the cost control work at all stages from undertaking, planning, design, procurement, construction, commissioning and completion, as well as various risks.

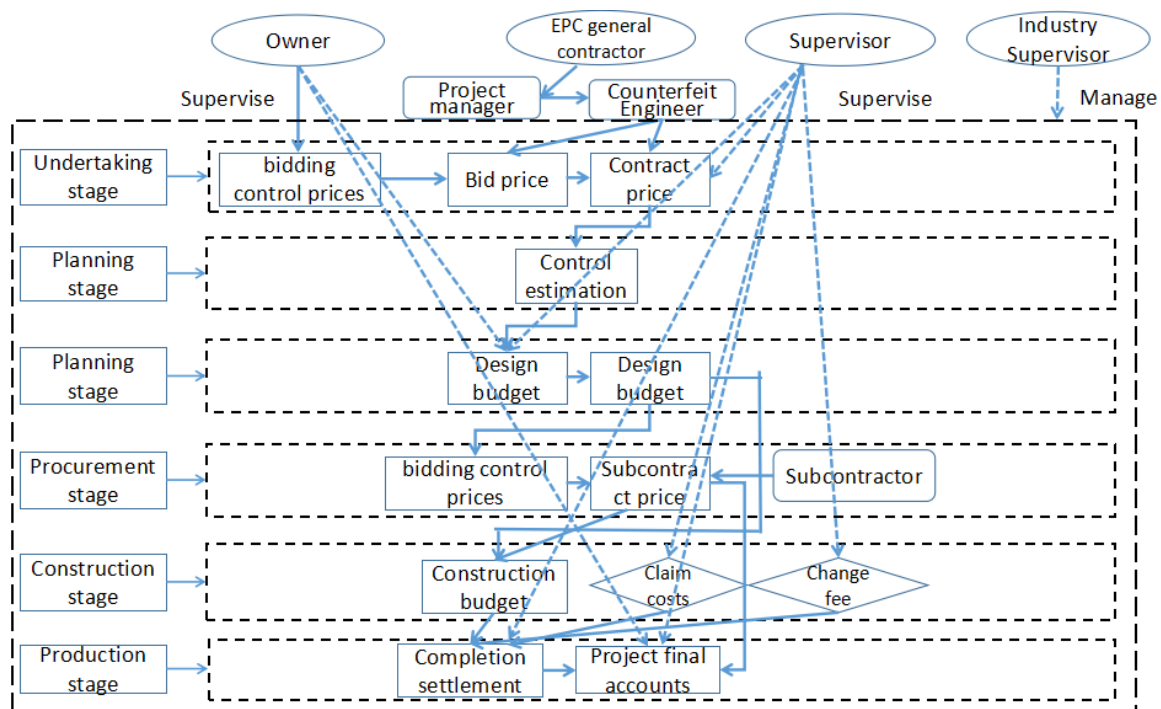


Figure 1. Standardized system of cost management in EPC general contracting mode

5. Conclusion

The construction of the standardization system for cost management of the EPC general contract model of water conservancy projects, with the focus on cost determination and control, implements the entire process cost management. It achieves controllable cost targets at all levels and lays a foundation for the

realization of the overall cost target, so as to achieve the cost target. This is of great significance to promote the economic and social benefits of the contractor.

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