



The Relationship between Pre-Estimation and Cost Management in Industrial Construction Projects

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Abstract: Industrial construction projects are the foundation of organizing industrial production, requiring both quality assurance and cost considerations. Pre-estimation of project costs and cost management are essential means and methods for project cost management. Strengthening the pre-estimation management of construction project costs can effectively control project costs and quality, save funds, and provide data support for management decisions. This article first briefly introduces the concepts of pre-estimation and cost management in engineering costs, focusing on the relationship between pre-estimation and cost management in industrial construction projects. It then proposes countermeasures from the aspects of enhancing the scientificity and accuracy of pre-estimation compilation and strengthening fine management on the construction site, aiming to provide some reference for the industry.

Keywords: engineering cost pre-estimation, cost management, relationship analysis, countermeasure proposals

1. Introduction

Industrial construction projects are the foundation of industrial production and an important part of economic and social development. Pre-estimation of project costs is an important means of enterprise cost management and also a significant supervisory tool. Industrial construction occupies a pivotal position throughout industrial production, requiring a balance between ensuring project quality and cost control. Enterprises need to correctly understand the relationship between pre-estimation of project costs and cost management, take effective measures to continuously improve the scientificity and accuracy of pre-estimation, and better guide cost management work to achieve a good balance among project quality, cost, and benefits.

2. Theoretical Foundation of the Study

2.1 Pre-Estimation of Engineering Costs

Engineering cost refers to the price of construction projects, representing the estimated or actual expenditure during the construction period. Pre-estimation of engineering costs, abbreviated as project budgeting, is the process of estimating project costs based on construction drawings, bill of quantities, contract prices, etc. Auditing the pre-estimation of engineering costs helps further control construction costs, save financial funds, and increase profits. Pre-estimation of engineering costs is a necessary step before project implementation, serving as the foundation for subsequent activities such as bidding and construction preparation. Pre-estimation of construction costs provides a certain level of protection for both parties involved. For the client (investor), project budgeting provides a clear understanding of the overall estimated cost of the project, aiding in scientifically evaluating and making decisions regarding the project. For the contractor (construction party), project budgeting provides important references for bidding, facilitating the establishment of reasonable bidding prices. Winning the bid provides crucial guidance for the entire construction process, enabling the contractor to allocate construction forces reasonably, ensuring the smooth progress of the project, and achieving a good balance between cost and profit.

2.2 Cost Management of Construction Projects

Project cost refers to the total expenses incurred by enterprises for construction, management, etc. Project costs can be divided into direct costs and indirect costs, material costs, and labor costs, etc. Cost management of construction projects is the process of controlling various aspects of the entire construction process. Strengthening cost management of construction projects is a key means for enterprises to reduce costs, increase efficiency, and enhance profits. For industrial construction projects such as factories, workshops, warehouses, etc., characterized by large internal spaces, high structural bearing requirements, and complex structures, strengthening cost management not only saves funds but also supervises the entire production process. This is helpful in ensuring project quality and progress, ensuring completion as scheduled. Cost

management of industrial construction projects mainly includes cost prediction, cost planning, cost control, cost accounting, cost analysis, etc. Among them, cost control and cost analysis are core components. Cost control involves the overall control of various elements such as construction materials, machinery, labor, environment, and site management. The goal is to minimize costs while ensuring quality and progress. Cost analysis involves comparing actual costs with the planned costs, identifying deviations, and promptly correcting them, which will play a positive role in cost control.

3. The Relationship between Pre-Estimation of Engineering Costs and Cost Management in Industrial Construction Projects

3.1 Commonalities between Pre-Estimation of Engineering Costs and Cost Management

From a broad perspective, both pre-estimation of engineering costs and cost management belong to the category of cost management. Costs represent the sum of benefits generated by completing a project. Cost management is a systematic process closely related to quality, progress, and risk control in construction projects. Engineering costs can be understood as a pricing basis for transaction activities, and to some extent, they influence costs. Pre-estimation of engineering costs provides the foundation and basis for cost control, while cost control is the means and approach to achieving the pre-estimated engineering costs. Only by formulating and implementing engineering cost pre-estimations reasonably can the effectiveness of cost control be enhanced, ensuring that projects proceed smoothly and achieve the expected economic benefits.

3.2 Differences between Pre-Estimation of Engineering Costs and Cost Management

Firstly, they differ in time. Pre-estimation of engineering costs is conducted before the construction of the project, generally prepared by the client (bidding party) or commissioned to a third-party professional institution. After the budget is determined by the bidding unit or reviewed by financial authorities, the bidding process can be organized. Upon selecting the winning bidder, the construction is organized by the winning bidder. Cost management, on the other hand, is primarily carried out by the contractor (winning bidder), although it covers the entire construction process, most of the time is spent during the construction process, where a series of measures are implemented to control costs while ensuring project quality and progress.

Secondly, they differ in scope. The object of pre-estimation of engineering costs is the entire project, including equipment, civil construction, etc., providing an overall estimate of the project's costs to support enterprise decisions. Cost management, on the other hand, focuses on partial control. For example, in civil engineering, it involves fine management of main materials, auxiliary materials, equipment facilities, personnel technology, site management, and comprehensive environmental factors. Equipment management emphasizes brand combination and comprehensive consideration of quantity and model types.

Thirdly, they differ in purpose. The purpose of pre-estimation of engineering costs is to provide both parties (client and contractor) with a clear understanding of the project, facilitating scientific decision-making. Additionally, pre-estimation of engineering costs serves as the basis for preparing bidding documents, focusing on forecasting beforehand. Conversely, the purpose of cost management is to control costs during the construction process, ensuring that project progress, quality, and costs are aligned, and project safety is guaranteed. It focuses more on mid-term and post-management.

3.3 The Connection between Pre-Estimation of Engineering Costs and Cost Management

The relationship between pre-estimation of engineering costs and cost management is one of mutual influence, mutual support, and mutual promotion.

Firstly, pre-estimation of engineering costs and cost management influence each other. Pre-estimation of engineering costs is the prerequisite and basis for cost management, requiring the formulation of corresponding cost management plans and control measures based on engineering cost pre-estimations. The rationality of the budget directly affects the effectiveness of cost control; an excessively high or low budget is detrimental to cost control. Conversely, enterprise cost management also has a certain influence on the preparation of engineering cost budgets. Changes in enterprise costs in similar engineering projects will also affect the corresponding budget amounts.

Secondly, pre-estimation of engineering costs and cost management rely on each other. There is a close connection between pre-estimation of engineering costs and cost management, relying on each other. The budget forms the basis for cost control; only by doing a good job in budgeting can actual costs be controlled and managed. Similarly, engineering cost budgeting is also the goal and basis of cost control. Only by checking against the budget item by item, identifying the causes of overspending, and taking corresponding measures can the purpose of cost control be achieved.

Thirdly, pre-estimation of engineering costs and cost management promote each other. Through cost management, en-

enterprises can further understand the actual costs of projects, thereby improving the scientificity and rationality of engineering cost pre-estimations. Timely grasping changes in raw material prices and personnel wages during construction is conducive to enhancing cost control and improving the scientificity of final settlements and cost accounts. Pre-estimation of engineering costs also provides important references and bases for construction cost management, enhancing the scientificity and accuracy of cost management and ensuring the smooth progress of projects.

4. Recommendations for Strengthening Pre-Estimation of Engineering Costs and Construction Cost Management in Industrial Construction Projects

4.1 Enhancing the Scientificity and Accuracy of Pre-Estimation Compilation

To maximize the positive role of pre-estimation of engineering costs, its scientificity and accuracy are prerequisites. The client (developer) should organize enterprises or third-party experts to study the engineering plans and drawings thoroughly, clarify construction requirements and project details, conduct market surveys, and confirm prices for various materials and equipment. Especially for industrial construction, which often involves large volumes and multiple structural elements, strict control measures should be applied to key materials such as cement, sand, gravel, steel bars, and bricks. Continuous monitoring of market price changes and national policy trends is essential to ensure price stability. Additionally, a certain amount of material should be reserved to prevent losses. Labor costs constitute the second-largest factor in industrial construction, mainly including civil construction and equipment installation. Although market prices are relatively transparent, they vary significantly depending on project requirements and duration. As industrial construction projects often have high requirements, the prices of skilled workers such as masons, steelworkers, and carpenters may need to be moderately adjusted upward. Once prices are determined, the next step is to calculate the quantity of work. Currently, the industry commonly adopts an integrated calculation method, aiming for precision and minimizing redundancy in measurements such as excavation volumes, brick foundation areas, and wall surfaces. For sub-projects, it's essential to calculate necessary components such as concrete, steel reinforcement, scaffolding, formwork (measure fees), and floor tiles.

4.2 Strengthening Detailed Management on the Construction Site Guided by Cost Pre-Estimation

4.2.1 Strengthening Raw Material Control

Raw materials are paramount in cost management, especially in industrial construction projects where they constitute a significant portion of project costs. Effectively managing raw material costs is pivotal to project success. Firstly, thorough preparation before material procurement is essential. Departments must diligently study cost estimates and design drawings, accurately calculate the total construction materials required, and prepare demand and usage plans. Currently, the industry commonly employs the ABC classification method to estimate materials on-site based on usage, fund allocation, and importance. Secondly, enhance material usage management. Emphasize the development and utilization of new technologies to reduce material wastage. Adhere to the principle of requisitioning materials as needed to prevent overuse. For materials with significant daily consumption, every effort should be made to control the total amount, minimize construction losses, and for high-priced items such as cables, implement fixed-rate supply. Excess materials must be approved before requisitioning, and if necessary, materials bundling method can be utilized. Strengthen daily management, strictly prohibit overuse, misuse, or waste of materials, and hold relevant personnel accountable for exceeding material usage.

4.2.2 Strengthening Construction Site Management

Enhancing construction quality control and eliminating rework are crucial aspects of cost control. It's essential to establish and improve construction technology management standards and on-site management systems, ensuring that construction personnel strictly adhere to specified technical standards and methods. It's imperative to follow construction plans precisely, refrain from cutting corners, altering procedures arbitrarily, or reducing work steps. Supervisory units must fulfill their duties, closely monitoring critical areas and key processes. Key construction activities must be supervised on-site, and each phase must pass inspection before proceeding to the next to ensure one-time qualification and eliminate rework. Strengthen site planning management, ensuring rational layout and transportation within the site to minimize secondary transportation costs. Enhance construction planning management to prevent conflicts or idle work during construction stages, ensuring continuous and stable construction progress. Strengthen site inspection work, implement self-inspection, mutual inspection, and handover inspection systems diligently, promptly identifying and resolving quality and safety hazards to prevent personal injury, rework, and repair, avoiding losses due to accidents.

5. Conclusion

Industrial construction serves as a vital foundation for the national economy, where both engineering quality and costs are crucial for social harmony, stability, and the healthy development of enterprises. It's imperative for businesses to properly manage the relationship between pre-estimation of engineering costs and cost management, utilizing comprehensive management tools, strengthening engineering supervision, and promoting cost reduction and efficiency improvement. Simultaneously, while focusing on cost control, attention must also be given to construction quality to prevent the adverse effects of cost-cutting competition on project costs and benefits.

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