Control Scheme for Expressway Project Cost

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Abstract: Project cost management is a comprehensive subject that integrates technology, economy and management into a whole, especially in the moment that the expressway develops so rapidly and the project cost keeps rising steadily, and it causes everyone to think deeply about how to accomplish project cost management. Thus, this paper briefly discusses a scheme for controlling the expressway project cost reasonably and effectively based on the actual situation of temporary expressway.

1 Project overview

The quickening pace of urban construction has led to the development of China's highway construction to a new level. How to effectively control the project cost and obtain the maximum economic benefits has become a concern of the construction enterprises. In the process of long-term engineering practice, although the construction cost of highway engineering has achieved some results, in the actual process, there are still many problems. In order to adapt to the pace of modern development and ensure the quality and safety of highway construction process, construction enterprises continue to explore the scientific control of project cost management, so as to obtain the greatest economic and social benefits.

Cost control is embodied in the whole process of highway engineering construction. Due to the long construction time and arduous tasks of highway projects, the entire process from investment decision-making to completion and acceptance of the project must be controlled to ensure that every construction cost is within a controllable range. In the whole process of cost control, it will be affected by various dynamic factors. Therefore, it is impossible for managers to formulate a scientific cost control plan at the beginning of the project. This requires that the cost control plan should be adjusted and improved with the development and implementation of the project, so as to make the cost more reasonable and scientific. Combined with the current situation of highway construction in China, it is necessary for construction managers to infiltrate cost control into every stage of project construction, personnel, materials and equipment and other links, so as to control the cost within the budget range and smoothly promote the implementation of the project schedule.

Lin'an-Jiande section of Linjin Expressway is an inter-provincial expressway that should be broken through between Zhejiang and Anhui, a key project in Regional Planning of Yangtze River Delta (GH [2010] No.38) and Development Planning for Urban Agglomeration in Yangtze River Delta (GH [2016] No.87) and has an important and far-reaching significance for improving the expressway network and accelerating the integrated development of Yangtze River Delta. The expressway starts from Qianqiuguan at the junction of Zhejiang and Anhui, passing through Lin'an, Tonglu and Jiande of Hangzhou to the south and finally ending at the interchange between Hangzhou-Xin'anjiang-Jingdezhen Expressway and Anren Expressway, where Anren Hub is set up to connect with Hangzhou-Xin'anjiang-Jingdezhen Expressway. The total length of the expressway is 85.5km.

Figure 1. Lin'an-Jiande section of Linjin Expressway

The project follows the two-way four-lane expressway standard specified in the Technical Standard of Highway Engineering (JTG b01-2014) [1], with the design speed of 100km/h, the standard width of 26.0m, the total length of 85.5km (wherein 23.3km/70 bridges and 33.7km/29.5 tunnels are set along the main line, and the length of bridge and tunnel structures accounts for 65.0% of the total mileage of line) and the estimated total investment of 20.648.3 billion yuan.

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Figure 2. Lin'an-Jiande section of Linjin Expressway

2 Cost control goal

2.1. The final account for completed project shall not exceed the approved estimation (excluding the factors such as land acquisition, demolition and policy growth)

2.2. The final account for the completed project shall save the cost by 2% or more than the initial approved estimation, and the land acquisition and demolition cost shall be controlled less than the approved estimation (excluding the factor of policy adjustment).

3 Important measures

3.1 Construction promotion with careful planning

According to the construction tasks of expressway, it is necessary to intervene in advance in the early stage of the project, accomplish project positioning and planning, define the guiding ideology and objectives of the project and take measures during project feasibility study, bidding document preparation, preliminary design and construction drawing design to achieve the goals. Meanwhile, it is also important to give full play to the organizational advantages of the subject, strengthen the management of construction projects, carefully plan the planning design, construction mechanism, section division and tender document preparation which may be affected by the construction investment greatly and carry out predicated risk analysis, evaluation and response.

3.1.1 Correct positioning and planning. When formulating the construction project objectives, it is necessary to establish the concept of life cycle cost of a project, plan an overall scheme comprehensively, consider all problems from an overall perspective, optimize the scheme in an all-round way and effectively reduce the cost in the whole life of the project

3.1.2 Establishment of good construction management mechanism. An organization structure shall be set up reasonably in the mode of “environmental protection of government construction and professional management of owners”.

3.1.3 Scientific section division, reasonable resource utilization, construction difficulty reduction and utilization ratio improvement of construction machinery. In terms of bid section division, it is necessary to fully consider the landform, construction roads and bridges, social environment, engineering difficulty and utilization of natural resources such as earthwork, avoid unbalanced resource allocation and unnecessary waste, and save project cost through project construction decision-making.

3.1.4 Focusing on macro decision-making of important contract documents and terms. During expressway construction, the engineering material cost accounts for 60-70% of the total cost, so it is a key factor for controlling the construction cost of the whole project. therefore, in order not to increase the investment or affect the construction due to large price fluctuation of main materials, it is important to deeply investigate the construction market according to the previous construction management experience and formulate reasonable material adjustment and compensation methods for the main materials such as rebar, cement and asphalt, so as to reduce the project investment.

Furthermore, it is necessary to entrust professional tendering agencies to prepare tender documents preliminarily, assign internal experienced professionals to review and revise the contract terms and avoid loopholes and ambiguities as much as possible; besides, in order to avoid unbalanced quotation of bidders and unnecessary expenses due to relisting and missing of quantities and drawing inconsistency, it is very important to arrange internal professionals or entrust other qualified units to review the bill of quantities carefully. In addition, it is necessary to focus on the performance awareness during contract execution, regularly or randomly check the required personnel, machinery and the completion situation of project nodes, implement rewards and punishment system in strict accordance with contract provisions, avoid the inadequate performance or execution of contract and unnecessary investment, and effectively control the project cost.

3.2 Focusing on the core innovation mechanism

The stage that has the greatest impact on project investment is the working stage before the end of technical design accounting for about 1/4 of the construction period. Wherein the preliminary design accounts for 75%-95%, the technical design accounts for 35%-75% and the construction drawing design accounts for 5%-35%, especially accuracy of geological survey data and the reasonability of design line have the greatest impact on the project cost, which is also the core of investment control,

and the core work is just to improve the quality of geological survey and select the design line with strong economy.

3.2.1. Introduction of geological supervision. It is imperative to strengthen the supervision on geological survey, especially the supervision on design location and quantity of geological drilling, the depth of exploration trench, the sampling integrity, indoor test, data arrangement and geological evaluation.

3.2.2. Introduction of consulting unit of route location design. Route design has the greatest impact on the whole project cost of expressway, so the purpose of strengthening the geological survey is to provide design parameters for optimizing the route design. With the development of surveying and mapping technology, the route selection and determination with electronic diagram and the skill and experience of designers play a decisive role in the route location design, and how to overcome the separation of design line from site is the key factor to determine the economy of line location design.

Therefore, it is a very beneficial measure to introduce consulting service units of route location design on the route survey and design stage of expressway, so as to dynamically track and consult the route layout, conduct field survey on the corridor along the line and put forward suggestions for the reasonability and economy of the route.

3.3. Innovation, pragmatism and fine management

3.3.1 Realize management standardization through informatization management. As the construction unit of a project, it is very important to implement information management to cope with the constant changes of construction, design, supervision and policy, so as to ensure the smooth progress of project construction. Generally, project information management ensures the accurate and fast flow of internal and external information of construction projects in the management organization by means of information technology. Therefore, the key factor is to realize effective integration of design information, construction information and management information, complete the effective integration of engineering chain and management chain and realize the digitization of the whole engineering design, construction and management, including the management optimization and process reengineering of the project management institution.

3.3.2 Strictly control engineering change with innovation mechanism. The biggest and most uncontrollable change factors of expressway in mountainous area is engineering geological change. Therefore, a real-time evaluation-dynamic design mechanism of cutting slope shall be established to predict the tunnel geology, improve the predictability and accuracy of slope rock mass and tunnel surrounding rock discrimination, correctly select the supporting methods, reduce excessive support, avoid instability due to improper support and control the engineering change reasonably.

3.3.3. Realize efficient, convenient, rigorous and accurate measurement with innovative engineering measurement system. It is necessary to deeply develop the measurement system according to the previous experience in measuring software system and the requirements of measurement management system and dynamic management system, and integrate the project division, quality assurance data and measurement unit. [3]

3.3.4.Strengthen field investigation and optimize detailed design. Due to the complex terrains, changeable geology and dense vegetation of mountainous expressway, the survey and design have large fuzziness, which leads to unreasonable and inaccurate schemes. Therefore, it is particularly important to strengthen the field check and optimization design of design scheme in the whole construction process.

4 Smooth progress with coordination and linkage

4.1. Create barrier-free construction environment. In the early stage of construction, it is necessary to rely on the local government and the "sunshine project" platform, set up a construction disturbance factor column on the network, expose the disturbance problems timely, try to solve the problems as soon as possible, create a barrier-free construction environment, improve the efficiency, promote the smooth progress of project and effectively reduce the cost. [2]

4.2. Cooperation, interaction and mutual benefit. In order to reduce the cost of the project, it is necessary to strengthen the communication and coordination with the construction unit and the headquarters in charge of the government policies, so as to jointly solve the problems occurred during construction.

4.3. Strict supervision of funds. It is imperative to conclude a fund supervision agreement of development organization, construction unit and bank through negotiation with the bank, avoid illegal capital outflow and inject circulating fund during construction as needed, so as to meet the normal production requirements, promote the project smoothly and improve the production efficiency. [4]

4.4. Disturbance reduction through field coordination It is necessary to supervise the construction dynamically and in real-time, coordinate and link up the construction of multiple units on the same working face, ensure the smooth progress of different

works, and avoid mutual restriction and influence on the construction progress due to coordination failure among contractors in advance. [5] [6] [7]

5 Conclusion

Since the management and control of highway project cost is a very complex process, the economic benefit of highway project can be controlled only when integrating the phased control, effective control and whole-process control into a whole.

In summary, the current market economy is developing faster and the competitive environment is getting more and more intense.

Engineering construction must not only fully consider the cost control situation, but also do a good job in engineering construction Cost management. Promote the effective control of related costs in all aspects of project construction, Not only must scientific and effective measures be formulated, but also the economic benefits of project construction must be improved.

Comprehensively improve the level of engineering construction cost management in my country.

About The Author:

Liang Bin (1981-), male, born in Shaoxing, Zhejiang, a postgraduate student and senior engineer. The author is now working in Hangzhou Urban Expressway Co., Ltd. and mainly engaged in engineering management.
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