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Analysing the Key Points For Cost Control of EPC Model Hospital Construction Project

Bu NaYan
China IPPR International Engineering Co.Ltd. , Beijing , 100089,China

ABSTRACT As the EPC (Engineering Procurement Construction) model became one of the widely used models in the areas of local and international construction, project managementbased on the EPC highlights its importance. EPC project commonly refers to the four stages of the project implementation process which are design, procurement, construction and delivery to a construction enterprise for integrated management. The advantage is that it can unleash the leading role of the design by overall optimization in the implementation of the project to realize reasonable cross and full coordination in the various stages of design, procurement and construction, achieving savings in investments as desired by the owners, shorten the construction period, improve the quality and other targets.

KEYWORDS
Hospital construction
EPC Project
Cost control

In recent years, as the domestic economy and construction sector continues to develop, construction projects has been on a development trend by increasing in scale, becoming more systematic and professional, which presented a serious challenge to the standard of project management of various parties participating in the construction. As a new contractor model that are in line with international norms, the EPC general contractor model has increasingly become the favourite of construction units, and is gradually adopted in mass by some municipalities in our country for infrastructure construction, government infrastructure construction, housing projects as well as a number of specialized infrastructure construction. Based on the requirements of hospital for the construction period and investment control of the project, we try to use the EPC (engineering procurement construction contractor) model.

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*Corresponding author:Bu Na Yan E-mail:mcq861213@sina.com

1.Concept of the EPC model, its advantages and disadvantages

1.1 Concept of EPC model

EPC is the abbreviations for Engineer (E), Procure (P) and Construct (C), which mainly refers to the contractor exercise strict control on the process throughout a construction project in accordance with the contractual agreement with the owners/customers. In normal conditions, the construction company has to undertake responsibility for the quality, cost, safety, progress, etc. for the projects undertaken in accordance with the contract.

1.2 The advantages of EPC model

EPC model has an incomparable advantage relative to the traditional contractor model, which are mainly shown in the following areas: Number one, in EPC model, the design proposal, budget proposal, construction proposal, etc of the project can be carried out and implemented effectively, which plays a guiding role in various stages of the construction project. Besides that, these proposals can be verified in the specific project management, which are beneficial to the contractor for continuous optimization. Number two, the EPC model can fine-tune the conflicts in various stages of the project construction process, and also the conflicts between sub-contractors, which are beneficial for streamlining the thinking of project management and the parties involved, optimising workflow and increases productivity. Number three, under EPC model, construction projects has a clear persons-in-charge, and the construction process also has very clear objectives and mechanisms for divisions of responsibilities, which are beneficial to effectively guarantee the quality, progress, safety and cost of the construction project. Figure 1 shows the workflow of EPC model.

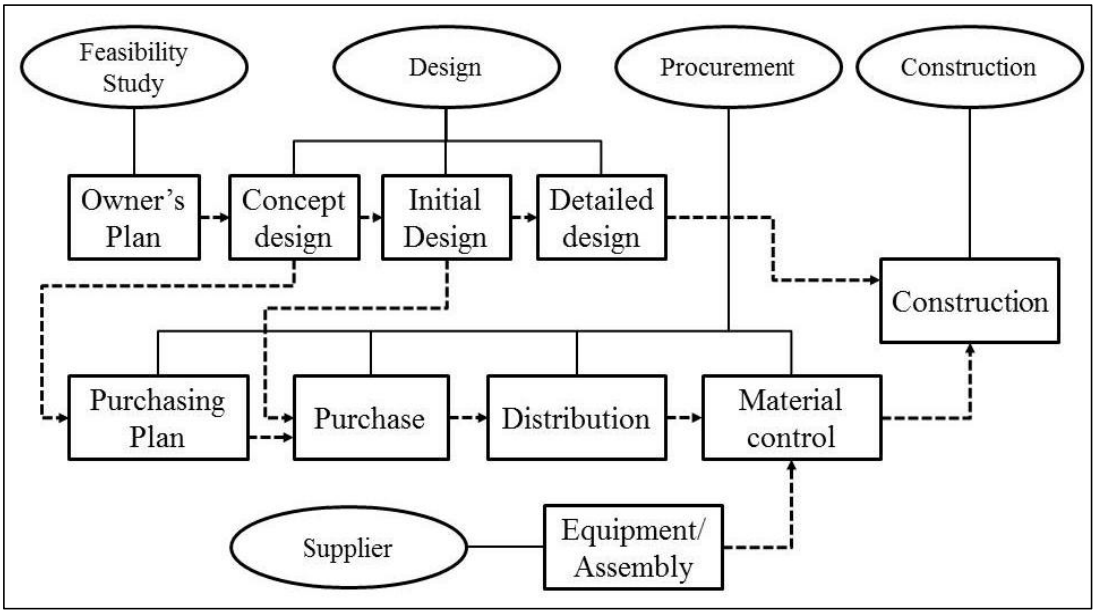

Figure 1 The work flow of EPC model.

1.3 The disadvantages of EPC model

1) The EPC contractor faces huge responsibility and has a high risk. Property owners transferred the risk of a project to the EPC contractor, thus the proceeds of the construction project and quality depends entirely on the experience and the level of the EPC project contractor. If the management or finance of the contractor has a major problem, the project also faces a huge risk. 2) The owners will have reduced management and control towards the construction project. The owner mainly monitors the EPC contractor through the EPC agreement, therefore, they cannot unduly interfere with the contractor's work, and also cannot approve most of the construction plan, thus they have low participation in the implementation of the construction process.

2.Key points of cost control for hospital construction project with EPC model

2.1 Showing examples of engineering applications

The 'Shougang Shuigang hospital overall site relocation engineering project, outpatient medical ward building, clinical workflow and related equipment EPC constructor engineering project' have a total construction area of 49952 square meters. It has one floor underground, 11 floors above ground (four floors annex). Designated number of beds are 728, which mainly includes the operation theatre, ICU, central sterile supply department, hospital information system, air flow system, inpatient ward, medical gases and other medical process design, construction, related medical equipment procurement, installations, matching decorations and other related renovations, (civil works has included all the contents besides the content mentioned); The focus of indoor design area includes the lobby, medical main street, conference room, restaurant, ward, nurse's station, corridors and other important spaces, in order to fulfil the requirement for national level 3 hospital. The project overall has excess investment, low building standards, and the original design unit has an imperfect medical process design. To improve the aforementioned problems, the owner adopts the EPC model for all the engineering design and construction of the project except for civil engineering. Through the design strength of IPPR to adjust the medical process and by IPPR's management level to increase construction standards, while control the overall investment, ensuring the construction period. The project received

high appraisal from the local government, and was delivered at the end of July 2012. The initiation of the EPC contractor engineering construction model for the local hospital improves the technical and management level of local hospital construction, formed the 'Shuigang construction model' at the southwestern region, opened up the EPC engineering market and established IPPR's medical construction brand.

Inner Mongolia Furui Health science and technology park project has a total land area of 910 acres, which consists of Furui Maternity Hospital, preparation centres, distribution centres and ancillary works, with a total construction area of 55000 square metres. In particular, the Furui maternity hospital has a secondary 'A' hospital setting in accordance with the Health Ministry construction standards, with a project construction size of 300 beds and 1000 daily outpatient visits. Total construction area of 35476 sqm includes the medical complex (34276 sqm) and ancillary buildings. The ancillary buildings include the logistics building (1000sqm), morgue (50sqm), sewage treatment plant (100sqm) and liquified oxygen plant (50sqm). The preparation centre is around 13980 sqm and is in line with GPM certification standards. Besides that, the medical distribution centre is around 5200 sqm and are in line with GSP certification standards. Also included is the boiler room and other ancillary facilities .

IPPR undertakes as the EPC contractor for this project, which includes feasibility study, proposal design, construction plan design, project construction, equipment and materials procurement, installation, system testing, defects repairing, completion and acceptance, delivery, after sales and related training work until the engineering quality warranty ends, and also helps the construction unit to complete the approval needed by the project, on-site access to water supply, electricity and roads as well as land levelling, geological survey and acceptance work. This project is IPPR's important and firm step in the process of establishing medical engineering contract business.

The construction of the institute of Luzhou Medical College Affiliated Hospital is the first phase of the Luzhou Medical College Affiliated Hospital new off-site construction, and is also the first phase construction in the medical area of the South-West Health city project. The total construction area is 175800 sqm, in which the construction area above ground is 127460 sqm, underground and semi-underground is 48340 sqm. The institute has a 960 bed inpatient ward (not including 40 ICU beds), 476 parking lots and 711 underground parking lots. The project has 3 underground levels, 15 levels of ward building (not including facility levels), total building height is 77.1m. The outpatient medical building is 5 stories above ground, with a height of 24.8m. The project is a type of high-rise building, has first level fire resistance rating, and its main structure type is reinforced concrete frame structure and shear wall frame structure. The building has class 'B' earthquake resistant construction, which can withstand earthquakes with a magnitude of 6, and has earthquake resistant precautions considered for magnitude 7 earthquakes. The building has first level waterproofing for the underground level, first level roofing and was designed for a 50 year lifespan.

IPPR sets the objective of creating 'South-West Healthy City Project' as its strategy and strive to build a high-end, modern medical industry park that combines medical, rehabilitation, pension, health care, scientific research as one.IPPR with its quality and professional technical and management level, controls the overall investment to guarantee the construction period, which received the praise and recognition of the local government.

2.2 Key points for project cost control

2.2.1 Precise definition of the project, good investment and price control

Before the project is tendered, the EPC contractor usually only has the design proposals, and does not have the detail design and construction plans. Therefore, the owner should accurately define and completely describe the overview of the background, scope of content, the expected objectives, functional requirements, main technological and economic targets, materials and equipment specifications and design standards of the project, and also to a possible extent, make a reasonable investment control price from the factors of engineering characteristics, engineering position, constructions with similar information and price increase during the construction period. The contractor can fully understand the requirements of the owner through this way and give a reasonable quotation during the tender, avoiding or reducing the unnecessary contract changes that occurs during the project construction process, which causes the amount of investment to be out of control. Compared to the traditional contractor model, the owners have to put in more effort for detailed requirements at this stage, and if necessary, introduce professional advisors for comprehensive planning on the project. This is also the main requirement for the EPC model to implement successfully.

2.2.2 Cost conttrol at the project design stage

Design is the basis for building projects and will impact the entire cost control of the construction project, thus selecting the plan that optimize the design can keep costs under effective control. Design errors sometimes caused significant waste in an investment, therefore during the preliminary design phase of a project, one must have a tight control on the investment for the project, which plays a vital role in the rationale and control of the project cost.

1) Choose the design unit rationally. The design unit must participate in the market competition through tendering or submitting proposals to avoid monopolies in the market, provide design proposals that are economical, practical and technologically advanced in the competition, enhance the design quality, shorten design cycles, and give better leverage to the investment returns.

2) Strengthen the management of design changes. Design changes is to perfect the engineering design, optimise the design results, rectify design errors, ensure quality of construction works and to meet the site condition changes, thus the additions and modifications to the design documents which is usually inevitable. But changes in different stages has different loss on costs; the earlier the changes were made, the smaller the loss. Therefore, the design changes should be controlled as close as possible to the earlier part of the design phase, especially major design changes that has huge impact on the construction costs, it is necessary to check the accounts first before making the changes in order to solve this problem, so the construction costs can be managed effectively.

3) Actively promote designs with limited costs. EPC contractor's price cannot exceed the budget of the corresponding scope of the contract. Under the premise of guaranteeing functions of the construction, the EPC contractor should control the initial designs in accordance with the approved design tasks and the estimated investments, control the construction designs based on the approved budget of the initial designs.

2.2.3 Cost control at the construction phase

1) Strengthen the contract negotiation

Before signing the hospital construction project EPC contractor agreement, the cost control engineer should have early involvement in the preparation and negotiations of the contract and seek participation in the preparation of the overall contract. When negotiating the contract with the construction unit, fight for conditions in favour of project implementation from the scope of the contractor, the contract terms plus formats, bill of quantities, drawings, technical standards and requirements, work schedule and other aspects, as well as more contract initiative. The EPC contract is the core issue of the entire project and the important prerequisites for doing a good construction cost management as well as the basis for project settlement, and the effect of settlement has a direct bearing on the economic performance of the contractor. So, it is necessary to do a good job on the signing of EPC contracts, which played a key role on effectively control construction costs.

2) Site visa control

The construction site visa is signed together on-site by the main contractor (professional engineer), the supervision engineer and the person in charge of the construction techinical unit. It is a written description about the construction implementation. The costs incurred during the implementation is part of the construction costs, and also the additional part of the subcontractor agreement, as well as the basis for construction claims. Hence, the cost control engineer must strengthen the management of the construction site visa, often go for site visits, check the progress of project implementation anytime plus check the handling of visa by each professional engineer in order to achieve the effectiveness and authenticity of the visa. This paves the way for auditing during the construction completion stage by subcontractors, and achieve the objective of effective project cost control.

2.2.4 Balance sheet management between the main contractor and sub-contractors

The completion settlement between the main contractor and sub-contractors can be regarded as the most important stage in the petrochemical project, the cost control engineer should audit the completion settlement by the sub-contractors in an accurate and timely manner. This poses great significance to the conclusion and analysis of the experience plus lessons learned of controlling project costs during the construction process, in addition of improving the level of overall cost management. The cost control engineer scrutinises the audit of the subcontractor settlement management, and reinforces the project settlement cost control management from the following aspects.

① The completion settlement should be based on the construction contracts, audit the project scope, content plus scope of the contract and the consistency of the content. ② Review the accuracy of engineering calculations, the consistency of the rules of engineering calculations and the price or amount code. The main focus of project cost auditing is on the review of bill of quantities. ③ Review the design changes and the legality, validity, effectiveness and the completeness of visa and other settlement information, plus the approval of the costs of project changes. ④ Review the stringency and timeliness of the execution of fee collection standards. Review whether the selection of quota is correct and reasonable.

The EPC model has the advantage of optimal allocation of resources, owner's management preference as well as comprehensive efficiency, and has huge prospects for future development. The EPC contractor management model still has many areas that need to be explored and improve, each hospital should combine their own situation, establish and perfect their management team and flow standard to maximise the advantage of the EPC contractor model as well as to avoid its disadvantages in order to realise the double objective of speeding up hospital construction project and control costs.

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