The application of EPC general contracting model in municipal road engineering

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Abstract. The municipal road is a necessary passage for citizens to travel. It has a great influence on the citizens' travel and the production and operation of the enterprise. It involves a wide range of issues and a high degree of social attention. This determines that the municipal road construction and reconstruction project has a short, flat and fast demand, which is fully compatible with the characteristics of the EPC model. This paper mainly discusses the advantages of using EPC general contracting mode in municipal road engineering and the key to management. It analyzes the problems faced by the actual engineering application and proposes corresponding strategies.

1. Introduction
With the development of urbanization, the role of municipal roads in the process of urban construction is becoming more and more obvious, more and more new construction and expansion projects, the disadvantages of traditional models are becoming more and more obvious, and the use of EPC mode is becoming more and more extensive. For projects that use EPC project general contracting, the general contractor stands in a unified overall position, planning the entire construction project as a whole, effectively avoiding various drawbacks under the traditional mode, making the municipal road project duration, Quality has been optimized.

2. The meaning and characteristics of EPC general contracting

2.1. EPC General Contracting Definition
EPC project general contracting, the essence is to give full play to the integrated management advantages of the general contractor, break the barriers between design, procurement and construction, which is conducive to the effective connection of all stages of work, and at the same time to the professional subcontractors with excellent construction techniques. Make reasonable matching to achieve direct and effective control of the progress, cost and quality of the construction project, and ensure that the project can bring better benefits to the owner and the investor.

2.2. Features of the EPC General Contracting Model
Take municipal road engineering projects as an example, EPC general contracting model is mainly the road project design, construction, trial operation and other links together to contract out, by a company with the corresponding qualifications and relevant experience to carry out general contracting. For the general contracting company, it needs to choose different subcontracting units according to the
engineering situation, grasp all aspects of the project, take responsibility for the whole process of municipal road engineering projects, and coordinate the relationship between the overall design, procurement, construction and other construction links. In addition, the general contracting unit should make full use of its own leading role, the possible links in road construction analysis, to ensure that the units responsible for the link can be integrated, rather than an isolated individual, to promote deep cross-cooperation can effectively enhance efficiency, to ensure the smooth implementation of the expected construction progress, and even shorten the duration, Effectively avoid unnecessary waste of funds for projects and ensure project quality.

![EPC project model and working process](image)

**Figure 1. EPC project model and working process**

3. EPC model development environment in China

3.1. Policy Boost
In 2016, the Ministry of Housing and Construction published "Several Opinions on Further Promoting the Development of General Contracting of Projects", which provided policy escort for the development of the EPC model. This paper gives a guiding solution to many problems encountered in the implementation of the general contracting of the project, and makes a very detailed agreement on the aspects of project contracting, enterprise selection and supervision review. In particular, "in accordance with the law to handle the construction project quality, safety supervision and construction permits and other related procedures." The relevant licensing and filing forms, as well as the relevant engineering management technical documents that require the general contracting enterprise to sign the opinions, shall add the column of the general contracting enterprise and the project general contracting project manager, etc., which solves the embarrassment of the status of the project general contracting unit in this mode for many years. Some provinces and cities have also introduced policies and measures in line with local conditions, it should be said that the general contracting model of the market development prospects faces good opportunities.

3.2. Organizational safeguards
The Ministry of Housing and Construction issued a summary of the EPC model for many years of exploration and implementation experience, but also to the landing and development of this contract model clear direction. In addition, after these years of continuous exploration and development, but also accumulated the market awareness of both sides of the contract, some investors are also more recognized
by this model brought about by the market benefits. Compared with the traditional model, it can save a lot of time, can be more overall in the project in the early stage of professional planning, can be some need to professional implementation of the risk to the professional experience and professional ability of the contractor to solve, professional person to do professional work, can maximize the professional advantages of the contractor.

In recent decades, along with the development of domestic infrastructure investment, especially the increase in foreign investment projects, the EPC model is also developing. Foreign investors more recognized the EPC model, with foreign management companies in China, they have perfect project management requirements and technical specifications, can be in the program stage to agree on the key content, to ensure that the project in accordance with the target requirements. In addition, many years of practice also let us from learning foreign investment, to develop and establish a set of project management system in line with their own national conditions and industry characteristics, and training and training of our own project management team, domestic customers are also gradually understanding and accept the EPC model of project management methods.

3.3. Customer Orientation
There is no doubt that the real success of a project is the final achievement of its functional requirements, the ultimate goal of the owner's construction project is to achieve its functional objectives. The more links the project goes through from project to final acceptance, the more participants, and the more difficult it is to control. EPC mode can make the design, procurement, construction and other different stages of a good connection, smooth development of the customer's final demand-oriented work model, to the end, this is the charm of EPC.

4. Advantages of EPC mode for municipal road projects
Municipal roads are the only way for citizens to travel, the impact on public travel and enterprise production and operation is very large, involving a wide range of social concern is also very high, which determines that the municipal road new construction and expansion project has a "short, flat, fast" demand, which is fully consistent with the characteristics of the EPC model.

4.1. The implementation of the project is efficient and the duration is controllable.
EPC general contractor in the construction project implementation process, can coordinate all parties, stand in the overall perspective of the project, based on the construction project as a whole, do a good job of the overall project planning and coordination operation. The effective coordination of the parties to the project solves the problem of unreasonable and inefficient convergence between design and construction, and can also reduce the intermediate link of procurement and construction, and smoothly realize the practicality, technical and safety integration and unity of the construction plan.

Huafa Road new construction in the actual production process, according to this type of contracting mode, the project is progressing smoothly, design, construction cooperation in place, the design materials that occur during the construction process and the market mismatch, design pipe changes and other issues are quickly resolved, saving time for the progress of the project,

4.2. Easy to control project costs, facilitate project financing, but also improve the enthusiasm of the general contractor.
EPC general contracting works typically use the total price contract model, especially the fixed total price contract, which ensures that the owner knows the final cost, payment time and amount of the entire project. At the same time, the general contractor in the fixed total price contract, although the risk is greater, but also reaped a higher profit margin, through the improvement of management level, the project implementation process optimization, can avoid a lot of unnecessary waste. Within the total contract price range, the portion saved through management optimization is, in accordance with the principle, which is the general contractor's incentive to work. On the other hand, in the total price contract model, if the project needs financing, the owner can more easily seek funds, and the investor
can also determine the final cost of the project, and know in advance the use of the funds, ready to do the relevant preparations.

4.3. The design is highly constructive and has few design changes.
Under the EPC general contracting mode, the design unit and the construction unit are all determined. When designing the design plan, the design unit can strengthen the communication with the construction unit, make full use of the construction unit's construction experience, understand its own equipment, etc. Targeted design optimization, in the selection of materials, through the communication of the general contractor, in advance material selection, improve the constructability and rationality of the design, reduce design changes.

5. Key of EPC General Contracting Model Management

5.1. Design Management First
In the municipal road engineering project, the three links of design, procurement and construction are closely related and mutually restrictive. The operation of each link will affect whether the municipal road project can be carried out smoothly. Therefore, we choose the strategy of design first. Take the overall construction organization design of a road project in Shanghai as an example. In this process, we first divide it into three main contents: road engineering, drainage engineering and ancillary engineering according to the project overview, and then combine engineering geological conditions with surrounding areas. Environment, first analyzes the difficult features of the project and the countermeasures, and does the overall planning and design of the project.

5.2. Strengthening procurement management
Now some domestic EPC general contracting units still do not have a sound procurement system, supervision system is not perfect, and the purchase of materials also needs multi-sector consultation, the process is more complex, resulting in a waste of time. It is recommended that in public procurement, first of all, communicate with the trading platform, do reasonable time planning, with time and financial advantages to win the trust of the trading platform. In the long-term procurement process, you can choose to establish long-term cooperative relations with creditworthy material dealers, on the one hand, can reduce costs, while ensuring the efficiency of material supply. In terms of capital, first of all, employees are required to do a bit of work, grasp the market material price, to achieve reasonable material hoarding and trial, at the same time, business leaders should pay more attention to this.

5.3. Strengthening risk control
Although there are still some risks in the EPC model, strengthening management can effectively solve most problems. Because the management level and technical capacity of the construction unit are relatively low between the construction unit and the general contractor, the EPC general contracting mode selects the excellent general contract management unit to transfer the risk to the contractor, and the contractor Take advantage of its own management level to minimize the risks. Because there are various risks from the start of construction until the handover, we must implement strict control on each step in the management system. For this reason, we have established quality in this new municipal road project in Shanghai. Guarantee measures, occupational health and safety production, civilized construction, fire management assurance measures, emergency plans, etc., with a view to reducing risks, and the practice has proved to be effective.

6. Summary
The management of municipal road project spree using EPC general contracting mode can better guarantee the design optimization and construction quality of modern municipal road projects in China. Through EPC general contracting model management can make full use of existing resources, to achieve
efficient procurement, high-quality construction, and effectively shorten the duration, there is a good application prospect.

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