

Research on the Management of the Subcontract Engineering of Highway Construction

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Abstract. This paper first points out that the subcontracting phenomenon is generally seen in the present highway construction market. Its existence has its inevitability and necessity. Illegal subcontracting and management are also commonly seen. To strengthen the management of the subcontract works in highway construction is of great significance. Then this paper introduces the definition, concept, type, basis and guarantee, relationship between parties concerned, conditions of subcontracting, and the relevant provisions of FIDIC. Through several engineering examples, it explains that there are advantages and disadvantages of engineering subcontracting in highway construction and the scientific management can hasten and avoid the disadvantages. Finally, from the concerned parties of the subcontracting engineering of the highway construction, this paper discusses the implementation of the management of subcontracting engineering. Combined with the current practice of the subcontracts, the paper puts forward suggestions on how to carry on the management of subcontract engineering for owners, supervisors and contractors, including the selection of subcontractors, contract management, quality management, schedule management, cost management and materials and construction technology management, which can be considered as a reference for the management of the subcontract engineering of highway construction in the future.

Introduction

Since the reform and opening up, the highway traffic had a fastest development and a largest scale with the most vitality of China in the history. Since the completion of Shenyang-Dalian Highway and Shanghai-Jiaying Highway of 1988, the highway construction developed at an unprecedented rate and the Chinese highway enterprises entered a new era, which the construction of highway and high grade highway was given priority to. At the end of the 20th century, the state put forward western development strategy, in which acceleration of the construction of western infrastructure is one of the keys. The slogan that “the western development should pay attention to highway construction” will be referred to a higher status.

At present, the domestic highway construction is in line with the international standards. Many international construction enterprises have extended their market to China; while many domestic enterprises also compete in the international construction market. In the implementation process of the international engineering project, in general, there is subcontract engineering and there will be corresponding subcontractors. Subcontracting phenomenon is also commonly seen in domestic highway construction market. In fact, in the process of highway engineering contract, the total subcontracting mode is commonly adopted. First of all, the owner awards the project to an enterprise

being qualified with a reasonable price. Both sides sign a general contract of construction in order to make clear the responsibilities and authorities of both sides. Within the permitted scope of law, according to parts or profession, the general contracting enterprise can decompose the project and award to one or several enterprises whose qualifications, credit and other conditions are approved by the owner or supervision engineer of the subcontractor.

Along with the Chinese economic development, the scale of the highway construction enlarges and there are more and more requirements to the highway construction. There are many reasons for engineering subcontract:

1. The reason of the highway product itself. Highway products have their unique characteristics: highway engineering is a complicated construction and installation engineering. It has many points, long line and scattered distribution. The production is liquidity and it is easy to be affected by natural complex. The construction condition is difficult and the construction link is complex.

2. The reason of the bearing ability of construction enterprises. For some projects, only a few enterprises can achieve the corresponding conditions and corresponding qualification, especially for special projects. It is hard to bear the whole project for an enterprise. Now there are many enterprises with low qualification, while there are many professional construction teams with professional competence which cannot get corresponding projects.

3. The reason of owners. Due to that some projects introduce foreign capital, some steel, wood, cement, equipment and other supplies are provided through international bidding procurement by owners. In order to ensure the quality of materials and equipment and the unity of specifications, some owners provide contractors with steel, steel strand, cement, mauerer seam, prestressed anchorage, etc. The purpose is not to affect the quality of the project due to that different contractors purchase materials themselves. So part of the goods being supplied by owners is also a form of subcontract.

4. The reason of the society. In construction, there will be a large number of surplus labors in the counties and towns which the highway being constructed is through. Although the qualification of the local road and bridge enterprises is not enough, they still can bear some engineering, such as cutting into mountains, wet masonry, dry masonry and some other channel engineering of small and medium-sized bridges. Owners give full play to the local advantages. When the bidder is designated, leave part of subcontract engineering to the local region.

5. The reason of division of labor in society. As the specialization of construction industry becomes more and more special, such as the construction of Hong Kong: pile foundation company is responsible for drilling pile and hitting pile; prestressed member company is responsible for beam plate component and round pipe culvert; steel binding company is responsible for steel processing, template company is responsible for (designing and producing) templates. The source of goods is responsible for the supply of cement concrete and asphalt concrete with pump truck and paver assisting. Other equipment is provided by leasing company and installation project relies on the hoisting installation company. Due to the development of specialization, contractor's equipment has no need to be very big and complete. There are many projects for contractors to subcontract after bidding. They can make full use of their advantages. The management costs and equipment investment of contractors also reduce dramatically.

The purpose of the paper: through the working experience of the author and the reference for many materials, the author researches and summarizes the management of subcontract engineering

of highway construction. The author hopes that the paper can be the reference of the specification and the management of the subcontract engineering of highway construction in the future.

The Subcontracting of Subcontract Engineering

Subcontract refers to that according to the professional nature or the project scope, after being approved by the supervision engineer or the owner, the contractor awards part construction to other subcontracting contracts and signs contractor with subcontractors. But the contract shall undertake all responsibilities and obligations to the construction of subcontractor which is signed with the owner. The "contractor" means its tender has been accepted by the owner, and signed a contract (protocol) with the owner and conducted the unit of construction project in the contract; while the "subcontractor" means the contractor subjects to the approval from the supervisor and reviews and obtains the client's approval, to subcontract a part of this contract engineering.

Highway construction is a part of the Chinese unified socialist market system, following the market admittance, the market competition and market trading rules, accepting the unified supervision of the country and operating management in accordance with the relevant state laws and administrative rules and regulations specified by the government departments. Subcontracting phenomenon exists in the highway construction market is assured. Contract Law, Bidding Law of People's Republic of China, Highway Law, Building Law, Bidding and tendering management method in highway engineering, Regulations for the construction enterprise qualification management, the highway construction market admittance regulation, etc. provide the basis and guarantee for the reasonable, legality and standard operation for the subcontract engineering of the highway construction.

The subcontract is relative to the general contractor. The contractor should not expect to escape from the legal and economic responsibilities in the contract through the subcontract, but it should still take full responsibility for the subcontractor's work. And the subcontractor is just bearing the responsibilities and performing the corresponding duty in contract. The relationship between the subcontractor and the contractor is the subcontract relation. The subcontractor's field work should be arranged and scheduled by the contractor.

There are no direct legal responsibilities, obligations or rights between engineers and subcontractors. However, the subcontractors must get the engineers' review and approval, from the signing to the construction of the subcontract is inseparable from engineers. Engineers shall have the right to instruct and decide subcontractors after being confirmed by contractors. Subcontractors must comply with the construction instruction confirmed by contractors.

Due to that the subcontract contract is the agreement between the subcontractor and the contractor, from a legal point of view, there is no contractual relationship between the owner and the subcontractor. The owner has neither the rights nor the contractual obligations to the subcontractor. Unless otherwise specified in the contract, the subcontractor has no rights to directly contact with the owner about payment, claim and working time. All the contacts with the owner must be through the contractor. According to the contract, in some cases, the owner can directly pay to specified subcontractors. The relationship among subcontractor, contractors, engineers and owners is shown in Fig. 1.

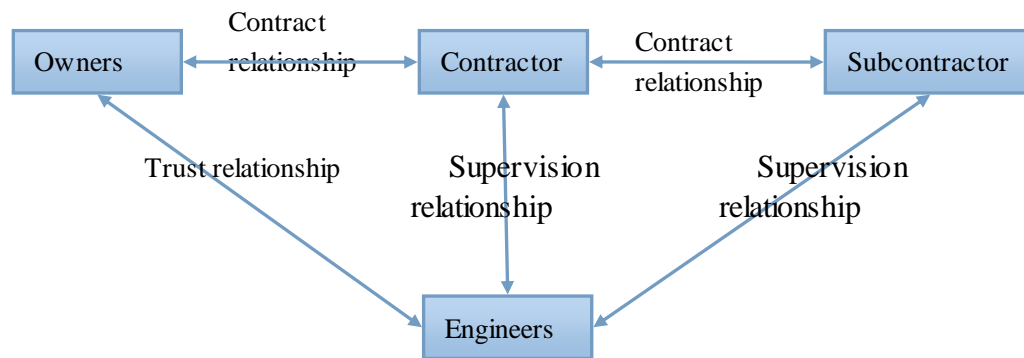


Fig. 1 The Relationship among Subcontractor, Contractors, Engineers and Owners

The Management to Highway Subcontract Engineering of Owners and Social Supervision

Along with the advancement of global economic integration and the strengthening of the construction market internationalization degree, the "game rules" of the Chinese construction contracting market will be used to gradually with the international standards. Especially after joining WTO, the civil engineering subcontracting mode has always got rapid development in China, and it will become the mainstream of future contracting mode. Therefore, the owner of civil engineering should not be afraid of the subcontract or prohibit the subcontract, but should from the resource, under the terms of the FDDIC and relevant national laws and the present situation of the domestic civil engineering market, combining with the domestic condition, explore a set of highway management mode and method of the subcontract engineering to adapt to the needs of the domestic construction market and provide conditions for the construction enterprises of China to participate in the international competition.

The characteristics of the highway product itself determine the subcontract behaviors in the process of highway construction. Owners are also inevitably faced and should not be taken to restrict or abandon. Owners should actively guide, manage and effectively make full utilization of them. For specific projects, the owner can consider to play professional subcontractor's specialty, and award non-major parts of projects to subcontractors, which can speed up the construction schedule and improve the quality of engineering. When determining the subcontract engineering, the owner can consider the following reasons:

1. Analyze the characteristics of the engineering from the design data provided by highway design units, such as the general requirements, key, difficulty and special requirements section of the engineering. Through the analysis of the characteristics of the engineering, give full consideration to the specific requirements of engineering and pick up the parts which are suitable for subcontract.

2. When it is necessary, set specially-assigned persons to the field to inspect whether it is good or feasible to conduct subcontract.

3. Before bidding, it is necessary to consider whether there are corresponding qualified contractors which can competent the whole project and whether they can complete the project guaranteeing both quality and quantity. If there are no or just a few such contractors, or the contractors cannot guarantee quality or quantity, the whole project shall be awarded to subcontractors.

4. During the process of bidding, it is necessary to inspect the quality of bidders, to ensure the smooth implementation of the project. If it is difficult for the bidder to implement, the project shall be awarded to subcontractors.

When determining the subcontract engineering, it is also necessary to consider whether the subcontract has a negative impact on investment, quality or progress of the whole project, to foresee the working difficulties which may increase in technology, organization and coordination and contract management.

The scale, professional level and management level of subcontractors have direct impacts on the amount and nature of their contracted projects. Subcontractors with high comprehensive quality will win contractors' approval through their efforts. Besides the subcontracted engineering, they will have the opportunity to continue to expand business. On the other hand, subcontractors with low comprehensive quality will lose their subcontracted engineering.

The Management to Highway Subcontract Engineering of Contractors

From the market point of view, the contractor is both the seller and buyer. From the perspective of engineering contract, it should not only take full legal liability for the owner, but also manage subcontractors and perform its obligations according to the subcontractor contract. Therefore, for the subcontract engineering, in addition that the owner and the supervision engineer should strengthen management, the contractor which has a direct relationship with the subcontractor and the authorities in charge of the subcontract works shall conduct complete supervision to quality, process and cost of the subcontract engineering, establish a set of comprehensive quality inspection and acceptance system and the security system of subcontract implementation, to ensure that all daily routine work in the implementation of the subcontract engineering can be processed smoothly and make all parts in the engineering be in control.

With increasingly normalized management market, highway engineering construction bidding and tendering work becomes a common way of trade in construction market. The 14th term of the implementation measures of the four systems in highway construction issued by the ministry of communications points out that, "Highway construction project should be carried out public bidding. National key projects and the local key projects determined by provincial people's governments are not suitable for public bidding. After being approved by the minister of development and plan of the state council and the provincial level people's government, invitation tenders can be carried out." It can be seen that bidding is the main method to choose contractors. In the same way, to obtain engineering in highway construction market to carry out production and reproduction and to get profit to develop, the construction enterprise must participate in the bid. As mentioned earlier, subcontracting phenomenon is widespread. In order to ensure the smooth implementation schedule of the project to facilitate contractors' management of subcontractors in the process of the project, the choice of subcontractors is of utmost importance.

For the construction engineering product, it needs a considerable investment and costs of labor, materials, energy. Investors (owners) pay a huge investment, and demand ideal produces which meet their requirements and hope the product can play a role in rated time. In the construction of highway engineering, quality is the key to the project construction. The problems of any link or any parts will have serious consequences for the overall quality of engineering, which directly affects the using efficiency of the highway, even causes huge economic losses because of rework. Therefore, the engineering quality is the life of the highway engineering construction. Due to the subcontract

engineering is an important component of the while engineering and the subcontract engineering is established on the basis of the contract, the quality problem of the subcontract engineering, on the one hand, may cause the waste of materials, the delay of working progress, the increasing of costs, the implementation of other kinds of construction and even the delivery for the whole project; on the other hand, it also has a certain degree of influence on the contractor, such as disrupting the control of the contractor, influencing the reputation of the contractor, etc. Therefore, to strengthen the quality management of the subcontract engineering is a necessary condition to ensure the quality of the whole project. In particular, the management of the subcontract engineering of the highway construction shall be improved. To enhance the quality control of the subcontract engineering in highway construction seem more urgent.

In the Chinese highway construction , the three-level quality management system, "government supervision, society supervision, enterprise introspection", has been used. As for subcontract engineering, general quality management system should include government quality supervision departments, social supervision, and the comprehensive quality management system with contractor, and the subcontractor enterprises participating in the whole process. Simply speaking, starting from planning, survey and design, to improve the engineering quality, reduce the engineering cost, the primary factor lies in the aspects of planning, survey and design. Excellent design scheme is the basis and premise of high quality engineering. Only good design can establish excellent project. The quality management of construction stage is the collective behavior in construction process with the participation and coordination of government quality supervision departments, social supervision, the contractor and the subcontractor, which is shown in Fig. 2.

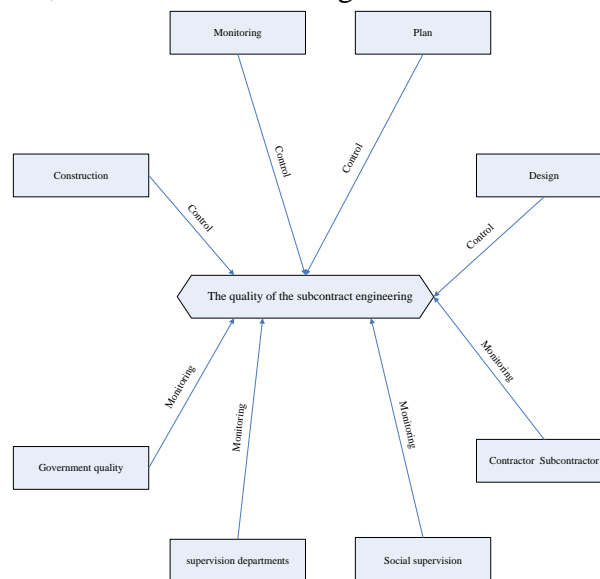


Fig. 2 The General Quality Management System of Subcontract Engineering

Whether the comprehensive quality management system can effectively make different departments do their jobs and ask each department cooperate and keep the good quality.

Conclusions

Through the reference of a large amount of materials and the working experience, the conclusion of the paper is as follow:

Explicitly forbid project subcontract. The simple subcontract is the root of the quality hidden trouble and contract disputes of contract. The laws and regulations both at home and abroad explicitly forbid the project subcontract.

Strictly control engineering subcontracting. Set a reasonable time limit and a fair price system for a project, and appropriately reduce the quantity of the single blocks, which can effectively avoid subcontract.

Correctly understand subcontract. Highway subcontracting phenomenon exists generally with significance. It should not be taken to restrict or abandon, but should be cautious to accept and conduct strict management. Absolutely put an end to the subcontract in private. If it is necessary, subcontract shall be decisively and actively stopped. The project shall be controlled by owners. The relationship between subcontractors and owners and subcontractors shall be clear which will be convenient for engineering management and guarantee the responsibilities, rights and benefits on both sides. Take subcontracting as a legal mean and write it into contract, which makes the owner can take measure when the subcontractor cannot complete a task or the quality or there is serious problem of process to ensure that the contract can inform smoothly. The contract gives subcontract legal status and legalizes subcontract.

Carry out the good section of the subcontract. Credibility, strength, qualified construction team is preferred, not just for quotation. The owner, the supervisor and the construction unit should agree to work together to carry out the good section.

Standardize the subcontract management. Fair, scientific and perfect contract is the premise to guarantee whether the interests and responsibilities of both parties in the contract can be smoothly performed and the root to guarantee the engineering quality and to avoid dispute.

Due to the limitation and conditions of the author's experience and references, there are many deficiencies of the above work:

Acknowledgment

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References

- [1] Reference to the foreign material is less which makes a lack of experience of the management mode of the foreign subcontract engineering of highway construction.
- [2] Collect less related engineering instance and the data is not full of typicality. The instances have not corresponding evaluation system.
- [3] Many of the contractors' management part to the subcontract engineering of the highway construction is shallow without deep study.

Suggestions:

- [4] Draw lessons from foreign successful management experience and take advantage of them combining with the domestic reality.

- [5] Form bidding model and contracts which can be applied to the subcontract engineering of highway construction.
- [6] Appropriately increase the proportion of the subcontract engineering of subcontractors in contracted projects and the specific amount remains to be further discussed.
- [7] In the future there should be the corresponding nationwide survey summary on the subject of the highway engineering subcontracting which can form normative documents, in order to guide the implementation of highway subcontract engineering.
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