IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 14, Issue 4 Ver. V (Jul. - Aug. 2017), PP 45-48
www.iosrjournals.org

Evaluation and Application of EPC Model to improve Project Construction

[1]Veeresh Solabannavar* and [2]Prof. Balasaheb Jamadar
[1]P.G.Student, Civil [Construction Technology] Jain College of Engineering, Belagavi.
[2]Guide & Professor Civil Engineering Department, Jain College of Engineering, Belagavi.
Corresponding Author: Veeresh Solabannavar*

Abstract: *The twelfth FYP shows large interest in investments in infrastructure sector by India, so there is need for different types of contract that will satisfy the purpose. EPC Engineering, Procurement and Construction are a common type of contract for large scale projects such as roads, telecommunication, petroleum, real estate etc. Here the contractor carry's out the designs of project, procure materials and equipment's required as per the specifications and delivers the project in agreed duration of time. Failing to deliver the project in stipulated time will make the contractor to bear the liability. The EPC contract process, various parameters such as contract price, contract period, liability, payment to contractor, risks involved are dealt in the study. A comparative study between PPP and EPC mode of contract will enable to know the feasible mode of contract in India. It lists certain advantages, disadvantages and their need in contract. Proper allocation of risks through contract is one of the risk management tools. Split structure of contract on-shore and off-shore is also dealt in the study with taxation regimes. A hybrid model of PPP and EPC for shadow tolling proves as an interesting approach for tension free revenue generation for usage of roads. Major domestic EPC players in India are listed. Nonetheless, the study covers Indian construction projects.*

Keywords: *EPC contract, PPP contract, taxation, risks, Shadow tolling, FYP*

Date of Submission: 12 -07-2017 Date of acceptance: 10-08-2017

I. Introduction

The considerable investments in infrastructure development after liberalization have improved the India's economic growth. The investment has increased to 56.3 trillion in 12th FYP which was 23.8 trillion in 11th five year plan (FYP). The GDP is increased from 7.2% to 8.6%. An efficient project delivery method is the key factor for any venture. Construction industry is rapidly growing and therefore requires various models of contracting. For mega infrastructure projects a flexible and effective method is needed. Engineering Procurement Construction (EPC) contract is a popular type of contract for infrastructure and power projects. EPC contractors carryout designs, procure the material and equipment's as per the specifications and deliver the project in stipulated time. Following factors are considered to measure the execution of project.
Time, Cost, Quality, Cost-overrun, Time- overrun, Unit cost of building, Rate of construction, Client satisfaction

1.1 Need for EPC: The Central Government and in addition State Government has been embraced development extends through traditional item rate contracts where the legislature gives the plan and gauges of amount for different items of work (BOQ). Installments to the contractual worker are made of estimations of work done in regard of everything. More often item rate contract are powerless to exorbitant time and cost overwhelms, other than question including extensive cases. The purposes behind terrible execution incorporate insufficient readiness of the venture and coupled estimations with the portion of various dangers to legislature consequently, the item rate contracting have been disposed of in created nations and in addition private parts in India. The agreements where the duty regarding outline acquisition and development is given to the temporary workers such contracts are commonly known as EPC contracts.

1.2 Technical Parameters: The specialized parameters proposed in the assent are mostly in light of yield parameters opposed to the ordinary routine with regards to concentrating on development determinations. The model stresses on 'what' rather than 'how' in connection to the attempts to be conveyed to the contractors. This gives the contractor required adaptability in creating and embracing imaginative outlines without containing with the nature of work.

1. Cost of contract- The agreement is settled lumpsum for the venture. It is subjected to alterations by virtue of changes in value list and in addition changes in law or change in extent of venture as the contractual worker can't be required to shoulder or handle the dangers ascending out of such things.

2. Time of contract- The agreement time frame is ordinarily project particular and relies upon the nature and volume of work included. The contractual worker might be at risk to harms or deferral in finish from determined date, subject to harms not surpassing 10% of agreement cost. Be that as it may, the temporary worker or contractor is taken into consideration expansion of time just for specific occasion or condition because of progress of degree or deferrals brought about by specialist or drive majeure.
3. Temporary worker/ Contractor selection- It will be founded on focused offering. All venture parameters for example contract period, specialized parameters and cost are to be unmistakably expressed and the short recorded bidders will indicate the lumpsum cost. The lowest bid will win the agreement.
4. Assignment of risk- The risks are assigned to those parties that can deal effectively. Appropriately the venture dangers for example specialized and development are rolled out to contractual workers. Be that as it may, specialist will subject to tolerate the dangers identified with land, natural clearances or moving of utilities.
5. Outline and construction- The EPC understanding time tables the dates on which distinctive areas of venture land will be passed to the contractual workers. EPC lays a roof of 10% of the agreement cost to control for any adjustments in the extent of venture, the cost of which the specialist should bear. An arrangement is made for risks where contractual workers need to shoulder the costs for not finishing the assignment as recommended or for not accomplishing the endorsement break through. The specialist will pay reward to the temporary worker if venture is finished before the completion period.
6. Drive Majeure- EPC gives insurance to contractual workers against political activity that influence the venture. The contractual workers will be ensured against subjective activities.
7. End/Termination- The end have been measured unequivocally. Political drive majeure and any issues by the client would give sufficient pay to the contractors and along these lines secure against oppressive activity by the expert. The assent enables the specialists to relinquish the execution security and maintenance of the contractor cash.
8. Supervision- Cooperation between the specialist and temporary worker day to day has been kept to uncovered insignificant after a hands off approach governing rules give legitimate records of the temporary worker or contractor. Its autonomy gives solace to all partners.
9. Point of reference based installments- It guarantees that installment or payment are made for all works affirming to the understanding. Everything of the venture is further separated into stages and installments will be made for each finished work.
10. Defect liability period- Normally, one year defect liability period is determined in layout portion of the agreement, an imperfection obligation time of 2 years has been indicated to give extra profit to the authority.
11. Random- The EPC assent additionally delivers issues identified with the determination of debate, rights suspension and change in law, protection and repayment.

II. Methodology

2.1 EPC procurement process

1. **Preparation of tender documents**- Tender documents to be prepared by the contracting party.
2. **Announcement and invitation to participate**- Announcement formulation, formulate criteria for selecting the suppliers to participate in tendering, publishing of the announcement.
3. **Receiving applications for participation**- Opening of applications, examination of application, supplier's selection to participate in tendering.
4. **Sending tender documents, receipt and examination of tenders**- Tender document distribution, opening of trades, examination of tenders and selection of suppliers.
5. **Notification of decision, grace time of 10 days and signing of agreements**- Publish notifications to the tenderers concerning award of contract, grace time of 10 days to elapse.

2.2 Stages of EPC contract at different risks

Risk	Pre-tender stage	Post-tender stage	Execution stage
Political risk	Political solidness of the nation, change in government	Delay in endorsements and land securing	-
Environmental risk	-	Ecological approvals	Unfavourable climatic and geological conditions
Technical risk	Deficient research on extension, asset accessibility, innovation pre-requisite prompting off base time and cost	Design changes, asset accessibility, site conditions	Unfamiliarity with landscape, utility moving, resettlement
Financial risk	Cost estimates and financing assumptions	Liquidity and credit storage	Foreign exchange and interest rate fluctuation
Market risk	-	Economic downturn	Setback in payment as of client
Contractual risk	Unfamiliarity with local laws and regulation	Unfamiliarity with local laws and regulation limited contract negotiations	Unfamiliarity with the local laws, tax and regulations
Force Majeure	-	-	Related to external hazards such as storm, floods, earthquakes, vandalism, sabotage

III. Comparisons Of PPP And EPC Contracts

3.1 Public Private Partnership (PPP): It is defined as, delivery of public infrastructure or public services with an agreement between public and private sector.

3.1.1 Forms of PPP: 1. Build operate and transfer (BOT)
2. Build own operate transfer (BOOT)
3. Build but operate (BBO)
4. Build lease operate transfer (BLOT)
5. Design build finance operate (DBFO)
6. Finance only
7. Operation license
8. Design build (DB)
9. Operation and maintenance contract (O & M)

3.1.2 Advantages of PPP: 1. Improved partnership between public and private sectors.
2. Increased rate of completion improves the construction capacity.
3. Proper risk allocation.
4. Better and enhanced performance.
5. Government support in the project.

3.1.3 Disadvantages of PPP: 1. Obligations of the harmony.
2. Loss of technical skill and control.
3. Loss of influence on funds.
4. Loss of technical staff.
5. Reduction of bargaining position with firm.

3.2 EPC- Engineering Procurement Constructions: EPC contract carryout designs of project, procure equipment's and materials required as per the specifications and deliver the project within the specified period of time.

3.2.1 Types of EPC contract: 1. Single document.
2. Privately negotiated.
3. Tendered out.
4. Issued under nomination basis.
5. Multiple documents.
6. Single document.
7. Lumpsum price.
8. Fixed price.

3.2.2 Advantages of EPC: 1. EPC project completion is fixed.
2. EPC approach in contracting is innovative.
3. EPC minimizes the owner's risks.
4. EPC for mega projects is more flexible and efficient delivery method.

The EPC contract plays vital role in infrastructure development. Due to investment by private partners in PPP risks are more to the private sector mainly to the lenders which go into bad loans and delay in project completion. Due to these risks nowadays there is low interest from the investors in PPP. Thus, government is moving towards the EPC mode as it has fixed time and cost limit.

IV. Hybrid Models Of EPC And PPP Contract- Shadow Tolling

Shadow toll is a payment structure where the road users need not pay the toll, but the concessionaire keeps the record of number of vehicles utilizing the road. The government will pay the concessionaire as per the agreed rates. It is mainly by the funds made available through increasing the cess on petrol and diesel.

Petrol & diesel cess ⟶ Government ⟶ Toll operators

V. Financial Risks And Bankability In EPC Contracts

A bankable contract is one in which hazard is allocated between the contractor and the venture organization that fulfills the loan specialists. Moneylenders concentrate on the contractual worker capacity to assert extra expense or augmentation to span and in addition the security given by the temporary workers by its execution. The banks lean towards a monetarily solid gathering to acknowledge all obligations regarding conveyance of the venture on time, on spending plan and meet the specialized and execution particulars. The ideal hopeful in this are the extensive perceived EPC contractors.

Large scale projects require large sum of money and are lengthy affairs. Such projects are usually filled with risks whether perceived or real. Risks vary from construction period to operating period. Each risk has to be properly dealt to ensure successful completion of project and operation. Loan specialists will require prequalification and bankability for chose consortium the accompanying.

1. Fixed fruition date.
2. Fixed fruition cost.
3. Performance assurances.
4. Single point duty.
5. Security from contractors and its parent organization.

EPC contracts convey all pre-requisites recorded as one bundle and because of his reason they are utilized as part of expansive scale project financed framework.

VI. EPC Players In India

Segment	EPC player
Construction residential/commercial	1. Larsen and Tourbo Ltd. 2. Shapoorji Pallonji and Co. Ltd. 3. B.G. Shirke Construction Technology Pvt. Ltd. 4. Man Infra Construction Ltd. 5. Supreme Infrastructure India Ltd.
Infrastructure/general contracting	1. Hindustan Construction Co. Ltd. 2. Gammon India 3. Simplex Infrastructure Ltd. 4. Gayatri Projects Ltd. 5. Nagarjuna Construction Ltd.

VII. Conclusions

The structure of model EPC understanding fuses best global practices and encapsulates an empowering authoritative system for development of venture in most effective, temperate and aggressive condition. The loan specialists will have particular necessities at both pre and post contact phases of venture. Both, pre and post contract project process must be bankable if lender support is to be secured. The greatest part of financing is finished by the moneylenders and remains to make lesser returns than value speculators. Thus, lenders are hazard contradict and use solid dealing position to relieve chance and augment the likelihood of obligations overhauling even in venture challenges.

Hybrid PPP and EPC model will increase the country’s revenue through the money collected from cess included in petrol and diesel price instead of tolls.

Reference

[1]. Milind Darade “A hybrid model of PPP and EPC contracts for highway construction in India” (2016) vol.3, journal of multidisciplinary research hub.

[2]. Shreedhar Patil “Comparative study between PPP mode of contracts and EPC mode of contracts” (2015), journal on recent and innovation trend in computing and communication.

[3]. Soroush Hezaikai “Risk allocation in engineering construction contracts” (2015) journal of applied mathematics in engineering management and technology PP. 63-74

[4]. Rahul Bali “Financial risk and bankability in EPC contracts” (2014) vol.11, journal of mechanical and engineering PP.45-49

[5]. Wai, Soon Han “Approach of EPC in construction project” (2012) vol.2, journal of applied science and technology.

Veeresh Solabannavar. “Evaluation and Application of EPC Model to improve Project Construction.” IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) , vol. 45, no. 48, 2017, pp. 45–48.