

CONTRACT DOCUMENTS IS EFFECTIVE TOOL FOR RISK MANAGEMENT

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Abstract- In this paper we discuss importance of risk management in construction project. Risk management in construction is concept that has utilized from proposal of project to the handover of the project. Construction activity involves a number of agencies like the owner; consultant & the contractor may have conflicting interests. In order to establish the duties, obligations, rights, responsibilities amongst the agencies, a contract is required to be made between them which will establish a mutual relationship to do a work. The contract can be used as a risk managing tool to by allocating risks to the various agencies through the various contracts between them and client, contractors and investors need to establish risk management policy throughout the project life. This paper proposes study of risk arises in the contracts. For that qualitative risk analysis is used which analysis helps to predict severity of risks. Risk management includes identification of risks in contract documents, risk classification, risk analysis and then risk control. This paper also found that severity of important risk, considering the suitable control measures from Client and Contractors point of view. The findings of paper are useful reference to similar construction projects in India i.e. for local clients, contractors, investors and government.

Keywords- Construction, Clients, Contractors, Contract documents, Qualitative risk analysis, Risks, Risk management.

INTRODUCTION

It is said that “no business is more exacting or requires greater effort and determination than construction,” since Construction is a complex and challenging process and requires interpretation of and conformance with myriad laws, codes and regulations among other activities. ^[3] Since the construction industry involves a multitude of people, from different organizations, with different skills and interests; a great deal of effort is required to coordinate the wide range of activities that are undertaken. A variety of unexpected events may occur during the process of procurement, execution and many of them can cause losses to the parties involved. Such uncertain events or set of circumstances that have an effect on achievement of one or more of project’s objectives, are commonly called risks. The most of civil engineering work is performed under contract. A contract provides a “self-contained statement of obligations as between its own parties”. The analysis has also identified several factors responsible for time and cost overruns - some within the control of the enterprises and some beyond their control. Contracts are vital to the success of a project is important difficult, costly and lengthy proceedings. The contract documents can be used as a tool to manage risk by allocating risks to the various agencies through the various contracts between them ^[4]. It is very important for all the agencies that they are aware at all times of the extent of risk exposure or the risks that they have to manage. If this awareness is lacking then it may lead to a number of disputes, disagreements and disruptions. One of the major reasons of disagreement and conflict is inadequate and defective contract documentation and also inappropriate contract arrangements and an unreasonable burden of risk being allocated to one of the parties by the contract. ^[4]

This study is on the risk management in construction contract aims to identify the key problems in certain critical areas of a construction contract, which if not attended to properly have the potential to become major roadblocks in the progress of the project. Problems have been identified in the areas of the Variation, Contract price and payment, Commencement, delays and suspensions, Insurances, Takeover/Handover after completion of works, opposition from local bodies. In present work, a case study infrastructure project in Pune city of Maharashtra state, India, has been referred. The study identify, classify of various risks in a given set of contract documents and on basis of qualitative risk analysis find out severity of these risks, suggests methods to mitigate risks in construction projects from the client’s and contractor’s view point.

BACKGROUND RESEARCH

There are various research papers on the risks management in construction projects. During literature study, D. W. Stam[8], and L. Y. Shen[9], proposed a Risk a risk management is explained as “a system which aims to identify and quantify all risks to which the business or project is exposed so that a conscious decision can be taken on how to manage the risks.” It also include; various risks; agencies involved, their roles; exposure of projects to risk; effects of project phase on risk. Contracting in Construction is also discussed and the contract documents essential are enlisted and their significance is spelt. The bridge between the two topics of Contracting and Risk is then discussed and the qualities of a “good” construction contract are enlisted. There are various techniques are available for assessment of risks as per purpose of study.

METHODOLOGY

The purpose of this study, the research methodologies are used in order to collect data, analysis data and report on findings and results. The research methodology selected for this risk management project comprised comprehensive literature review, followed by open interviews and distributing questionnaire surveys to the various agencies i.e. client, contractors, consultants of the projects. Collected data was analyzed using statistical techniques to study variation between responses of contractors and owners. . Fig. 1 shows the research methodology flow chart as used for this study.

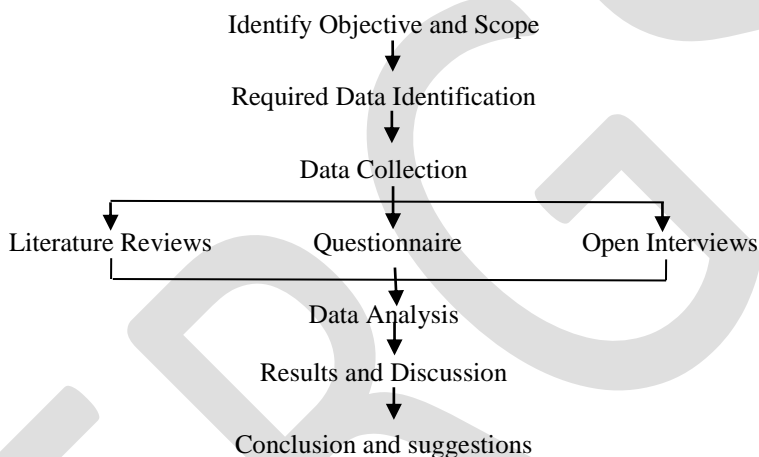


Fig. 1 Research Methodology Flow Chart

DATA COLLECTION

For the purpose of this study, a set of contract documents of the infrastructure project of flyover in Pune city of India has been referred. To alleviate the congestion at junctions, government has planned project of three flyovers. From the reviews of questionnaire survey and open interviews, there is suspension of project work which result cost overruns and time overruns. The project through an existing heritage structure and after construction some part of heritage structure will be on the road and the main entrance of the heritage structure would be closed forever. The traffic will move very close to the heritage buildings. Existing structure and social- non government agencies oppose the project. To preserve a heritage structures client changed the design. Table I shows the referred contract documents between client and contractor.

TABLE I : REFERRED CONTRACT DOCUMENTS

| Sr. No. | Contain |
|---------|---|
| 1 | Tenderer Notice |
| 2 | Detailed tender notice |
| 3 | Instructions to Tenderers |
| 4 | Declaration of the contractor |
| 5 | General Conditions of contract |
| 6 | Special Conditions of contract |
| 7 | Technical Specifications |
| 8 | Tender of works |
| 9 | Letter of Acceptance |
| 10 | Material Brought By Contractor |
| 11 | Schedule A, Schedule B |
| 12 | Suggestive:- Format for Cement, Steel &Aspalt |
| 13 | Price Variation Clause |
| 14 | Bill of Quantity |

RESULTS AND DISCUSSIONS

Here the various risk related to the contract document of project are identified, studied, classified and analyzed. From the study of contract document, it found that there are various clauses mentioned, as General conditions, Technical specifications and special conditions. With the help of the checklist given by L.Y. Shen risks are identified and grouped in eight different categories which are physical risk, financial risk, legal risk, construction risk, political risk, design risk, environmental risk & contractual risk. Table II shows the matrix of risks and types of risks for condition of contract. The risk assessment matrix is formed according to the impact of risks on client & contractor. Because every clause of contract is may be converted into the risk & it may effects on different perspectives of the project i.e. time, cost, scope, quality.

TABLE II :RISK MATRIX OF CONDITIONS/ TYPE OF RISKS CONTRACT DOCUMENTS

| Conditions of Contract | Risks Classification | | | | | | | |
|--|----------------------|-----------|-------|--------------|-----------|--------|---------------|-------------|
| | Physical | Financial | Legal | Construction | Political | Design | Environmental | Contractual |
| General conditions | | | | | | | | |
| Suspension of work | | * | | | * | | | |
| Changes in design | | * | | * | | * | | |
| Extension of time | | * | | | | | | * |
| Penalty for delay | | * | | | | | | * |
| Insurance and Indemnity | | * | | | | | | * |
| Labour regulations | * | | | | * | | * | |
| Extra works | | * | | * | | | | |
| Accidents | * | | | | | | | |
| Quality assurance plan | | * | | * | | * | * | |
| Technical Specification | | | | | | | | |
| General and Supplementary tech. spec. | | | | * | | * | | |
| Prevention of property | | | | * | | * | | |
| Tests List with frequency | | | | * | | * | | |
| Special conditions | | | | | | | | |
| Advance | | * | | | | | | |
| Dispute and Arbitration | | | * | | | | | * |
| Arrangement of traffic during construction | * | | | * | | | | |
| Completion certificate | | | | * | | | | * |
| Environmental safeguard | * | | | | | | * | |
| Price variation clause | | * | | | | | | * |
| Opposition from social Bodies | | | | | * | * | | |
| | | | | | | | | |
| | | | | | | | | |

Qualitative risk analysis (QRA):

Qualitative risk analysis determines the importance of addressing specific risks and guides risk responses. It helps to determine the likelihood and potential effect of the risks on the project objectives. It provides a quick and clear picture of risks and is easy to understand. To do this analysis QRA Sheet was used which consists of identified risks classified into various types requiring a subjective response on the probability of its occurrence on a 5 point scale of: very low, low, medium, high, very high and on the impact of these risks again on a 5 point scale of, very low, low, medium, high, very high. The responses on QRA sheet were analyzed using median as a measurement of central tendency.

Table III shows sample format of QRA sheet which consists of the probabilities and impact assessment by ranking method responses of contractors and owners. For performing qualitative analysis, the responses of owner and contractor on their assessment of probabilities and impact of risks were analysed to arrive at a single rating for each risk. This rating is plotted in Table IV which shows the opinions about probability & impact related to owners & contractors point of view.

TABLE III: RISK RANKING FOR CLIENT AND CONTRACTOR

| | | Risk A | CumFreq. | Risk B | Cum. Freq. | Risk C | Cum. Freq. | Risk D | Cum. Freq. | |
|-----------------------|---|-------------------------------------|----------|--------|------------|--------|------------|--------|------------|---|
| Client/ contractor | P | Risk Probability Level (p 1 to p 5) | | | | | | | | |
| | | p 1 | 1 | 1 | 3 | 3 | 1 | 1 | 2 | 2 |
| | | p 2 | 2 | 3 | 1 | 4 | 1 | 2 | 1 | 3 |
| | | p 3 | 0 | 3 | 0 | 4 | 0 | 2 | 1 | 4 |
| | | p 4 | 0 | 3 | 0 | 4 | 0 | 2 | 0 | 4 |
| | | p 5 | 0 | 3 | 0 | 4 | 0 | 2 | 0 | 4 |
| | | ∑ p | 3 | | 4 | | 2 | | 4 | |
| | I | Risk Impact Level (i 1 to i 5) | | | | | | | | |
| | | i 1 | 1 | 1 | 2 | 2 | 1 | 1 | 2 | 2 |
| | | i 2 | 1 | 2 | 2 | 4 | 0 | 1 | 0 | 2 |
| | | i 3 | 1 | 3 | 0 | 4 | 3 | 4 | 2 | 4 |
| | | i 4 | 0 | 3 | 0 | 4 | 0 | 4 | 0 | 4 |
| | | i 5 | 0 | 3 | 0 | 4 | 0 | 4 | 0 | 4 |
| | | ∑ i | 3 | | 4 | | 4 | | 4 | |

TABLEIV: RATING FOR RISKS IDENTIFIED IN CONTRACT

| PMC conditions | Owner | | Contractor | | Responsible Party | Method of Management |
|----------------------------------|-------------|--------|-------------|-----------|-----------------------|--|
| | Probability | Impact | Probability | Impact | | |
| Change in Design | High | High | High | High | Client Consultant | Pre- project planning Allocation- changed conditions Mitigation- Expert Constructability reviews |
| Opposition from Social Bodies | Medium | High | High | very high | Client | Mitigation- Constructability reviews, Strong government support |
| Suspension of Work | High | High | High | High | Client | Giving extension of time to contractor Add the exact amount in proportion of suspension time loss. |
| Extra Works | Medium | High | Medium | Medium | Client Consultant | Payment for extra work Re-estimate |
| Accidents and safety | Low | Low | Medium | High | Contractor | Safety controls and insurance |
| Penalty for delay | Medium | medium | Medium | Medium | Contractor | Notice provisions for delay Conflict Resolution clause |
| Dispute and Arbitration | Low | Low | Low | Medium | Client and contractor | Disputes Resolution Board Insurance |
| Extension of time | Medium | medium | Medium | High | Client and contractor | Allocation- Extension time clauses incentives or performance bond |
| Insurance and Indemnity | Low | Low | Low | Medium | Client and contractor | Allocation- Insurance and Indemnity conditions Proper investigation, Inspection |
| Prevention of property | Medium | medium | Low | Medium | Consultant | Constructability reviews, pre-plan for NOC and project feasibility |
| Price variation | Medium | High | Medium | High | Client and contractor | Analysis- economic Allocation- escalation clauses Mitigation – introducing phased planning |
| Quality assurance | Low | medium | Medium | Medium | Contractor | Mitigation – control procedure Contingency- rework |
| Labour regulations | Low | medium | Medium | Medium | Contractor | Allocation- labour regulation clauses |
| Excessive approval by government | Medium | medium | Medium | High | Client | pre-plan for permits & approvals Project feasibility |
| Material management | Low | medium | Medium | Medium | Contractor | Inspection, record keeping. |
| Traffic diversion | Low | medium | Medium | Medium | Consultant | Pre- project planning |
| Noise pollutions | | | | | Client and contractor | Mitigation- use strict pollution control measure Analysis- site investigations |

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CONCLUSION

This paper systematically examined major risks affecting the infrastructure project. In this paper qualitative risk analysis technique provides an effective insight and clear picture of the risks involved in infrastructure construction in Pune city. The contract documents are used as a tool to manage risk by allocating risks to various agencies through various contracts. To minimize the chances of failure or under-performance, risk management policy must be implements and evaluate regularly into the construction project. This study provides useful references to any infrastructure construction projects in India.

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